

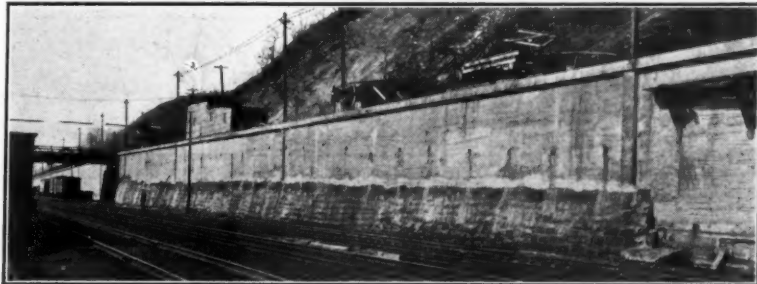
JUN 28 1922

PUBLIC WORKS

CITY

COUNTY

STATE



IMPROVEMENT OF EAST OHIO STREET, PITTSBURGH

Excavating and Sheet piling Side-Hill Trench for Retaining Wall.
Concrete Retaining Wall (Type E) Built on Top of Old Masonry Wall.

IN THIS ISSUE

Improving East Ohio Street, Pittsburgh

Dont's for Sewerage and Water Works Engineers

Street Cleaning Performance and Cost Data

Sewer Trenching in Running Sand

Index of Volume No. 52

JUNE 24, 1922



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PUBLIC WORKS.

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A Combination of "MUNICIPAL JOURNAL" and "CONTRACTING"

Vol. 52

June 24, 1922

No. 25

Improving East Ohio Street, Pittsburgh

Widening and raising, lifting water mains in service, building high retaining walls and paving one and one-half miles of an irregular side hill street at a cost of approximately \$525,000

East Ohio street, Pittsburgh, runs approximately northeast near the shore of the Monongahela river and adjacent to a number of tracks of the Pennsylvania railroad. It is at the foot of a very steep, high, rocky hillside which in some places intersected the roadway, and in other places receded somewhat from it, affording sites for buildings north of the street.

The street was partly unimproved and partly paved with stone blocks and at the west or city end there were several hundred feet of 54 and 36-inch brick sewers and of terra cotta pipe sewers from 15 to 18 inches in diameter with pipes, laterals, manholes and

feet and some grades as steep as 4 per cent. Along the east side of the street the roadway was protected for about two thousand feet by an old stone masonry retaining wall, close to the foot of which the Pennsylvania railroad main line tracks were laid. The top of the wall was surmounted by a high wooden picket fence. The street was poorly lighted and graded and generally in poor repair.

In order to provide a much needed betterment, the improvement of the street was authorized and work commenced May 24, 1920, on a contract which was awarded to the Thomas Cronin Company, which completed it December 13, 1921.

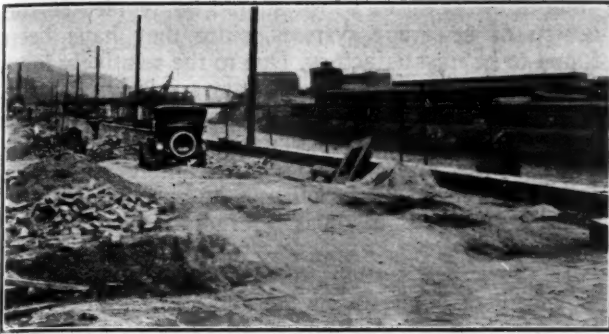


FORMS ASSEMBLED AND SHEETING TEMPORARILY BRACED FOR CONCRETING. FINISHED WALL IN BACKGROUND.

other appurtenances. Two tracks of the Pittsburgh Street Railroad electric car line were installed in the street, which also carries a traffic of heavy trucking and automobiles, horse-drawn vehicles and pedestrians.

The width and grade of the street were very irregular, the width at some places being as little as 30

The principal items of the contract included building the street to a uniform width of 56 feet, including one 10-foot sidewalk on the up-hill side of the street, elevating the surface to a maximum of 6 feet additional height, changing the grade to a general slope of eight-tenths per cent in most places, building a concrete retaining wall over a section of



WIDENING STREET BEHIND WALL RETAINING
SIDE HILL FILL.

forms that were made in large panels for the concrete work.

CONCRETING

As the excavation was made for the retaining wall, one side of the trench was sheeted with 2-inch wooden planks placed by hand and securely braced by rangers and inclined struts. The latter were removed after the forms for the face of the wall had been placed, thus permitting the sheeting to serve as the form for the rear of the wall, most of the sheeting being left permanently in position and covered by the back fill, which was placed by hand.

Concrete materials were delivered in the road by motor trucks and the concrete was machine-mixed and spouted directly to position in the forms through short wooden chutes handled by the locomotive crane in special places and generally for the retaining wall on the opposite side of the road which protected the face of the bluff.

UNIT PRICES

The total force employed averaged about 150 men and the work was executed under the direction of A. N. Dick, senior assistant engineer, Pittsburgh Department of Public Works, Bureau of Engineering, John Swan, director, C. M. Reppert, chief engineer, and Tom M. Reed, assistant chief engineer.

The principal items of the contract included 33,230 yards of embankment at \$1; 15,000 yards of excavation; 17,050 square yards of new standard sheet asphalt pavement at \$3.40 per yard; 4,900 square yards of new vitrified brick pavement, at \$0.50 per yard; 7,753 lineal feet protected concrete curb type one, at \$1.30 per foot; 74,500 square feet concrete sidewalk type one, at \$0.30 per square foot; 5,440 yards plain concrete in the retaining walls, at \$14.50 per yard; 7,308 yards reinforced concrete in retaining walls, at \$15 per yard; 375,300 pounds steel reinforcement, at \$0.06 per pound; 6,476 lineal feet

of standard fence No. 7, at \$0.50 per foot and about 20 minor items.

Don'ts for Sewerage and Water Works Designers

Features to be Avoided in Designing Sewerage and Water Works Systems, as Set Forth by the State Board of Health of Minnesota

In its instructions for the submission to it of plans and specifications of proposed water and sewerage systems, the State Board of Health of Minnesota presents a number of "Features to be Avoided" in preparing the designs. The following paragraphs are quoted from the Board's instructions, as revised in May, 1921.

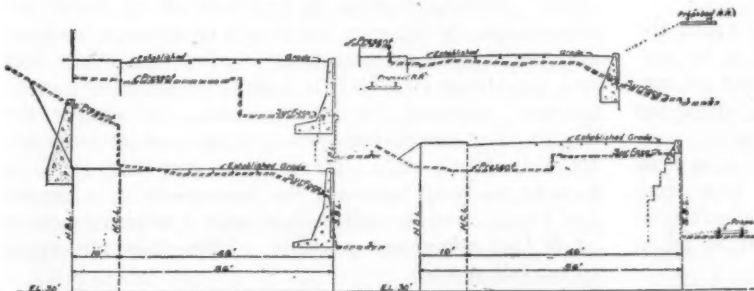
WATER WORKS DESIGNS

The following is a brief statement of some of the features to be avoided in the design of a water supply system, since they have been found to be dangerous from a sanitary point of view. Plans including these features will not receive the approval of the State Board of Health.

1. Wells, pumping apparatus, exposed suction mains, reservoirs, and filters located where they will be subject to flooding with surface water during high water periods.

2. The improper construction of well casings and covers and the lack of adequate provision for surface drainage to prevent pollution with surface water. The outer casings of drilled wells shall extend to a height of at least 6 inches above the pump room floor and a suitable connection made between it and the drop pipe which will effectually prevent waste water from entering the well.

3. Pits around drilled wells, where pumps of the deep well type, or so-called vertical turbine type, are used. Where water is pumped from drilled wells by means of suction pumps of the reciprocating or centrifugal type directly connected to the well casing, it shall be permissible to construct a pump room, the floor of which may be below the surface of the ground. In this case the well casing shall project to a height of at least 12 inches above the pump room floor. The pump shall be placed upon suitable foundations of sufficient height so that no part of the suction pipe, valves, etc., will be at an elevation lower than 6 inches above the pump room floor. Water tight screw or flanged connections should be made between the top of the well casing and the suction pipe. The pump room floor shall be sloped to drain away from the well casing and pumping apparatus towards a water tight sump located at least 4 feet from the well. This sump shall have a capacity of at least 12 cubic feet. A pump shall be provided to remove any waste water, or seepage, collecting in the sump, to the surface of the ground. Where possible this pump shall be ar-



GENERAL CROSS SECTIONS SHOWING CHARACTERISTIC FILL,
SIDE HILL EXCAVATION AND RETAINING WALLS.

ranged for automatic operation. The walls of the pump room shall project to a height of at least 1 foot 6 inches above the general level of the ground surface and 6 inches above the grade line of the building.

Where it is necessary to pump from a series of wells by means of suction mains leading to a central pumping station, and where it is impossible to locate the suction mains above the ground surface, the manholes around all wells and valves on the suction pipes shall project to a height of at least 1 foot above the ground surface. In case it is necessary to locate remote controlled suction pumps in pump pits at the wells which are isolated from the central pumping station, the walls of these pump pits shall project to a height of at least two feet above the ground surface. These manholes and pump pits shall be water tight, of brick or concrete construction, and shall be provided with manhole openings equipped with rings having raised edges and with solid covers with overlapping edges. Pump pits should be provided with sumps and automatic ejectors wherever possible.

4. Improperly constructed underground or surface reservoirs. Underground and surface reservoirs shall be water tight and constructed of some permanent, substantial material. Manhole openings to underground reservoirs which are covered with earth shall project to a height of at least 12 inches above the ground surface. These manhole openings shall be provided with solid water tight covers having overlapping edges which shall be provided with locks. The edges of manhole openings to surface reservoirs, the tops of which are above the ground surface, shall project to a height of at least 3 inches above the top of the reservoir. These openings shall be provided with solid water tight covers having overlapping edges and shall be provided with locks. Reservoirs shall be constructed without ventilators. Properly constructed vents located in the roof are permissible. Cleanouts to reservoirs shall not have connections with sewers, or to any body of water the surface of which is or may be raised to an elevation higher than the bottom of the reservoirs.

5. The connection of any part of the system with sewers by means of which it is possible for sewage, even under exceptional circumstances, to back up into the wells, storage reservoirs, etc., and thus pollute the supply.

6. Systems using surface water without adequate treatment. The treatment required will depend upon the local conditions.

7. Emergency connections by means of which untreated surface water, or water of questionable or unknown sanitary quality may be admitted to the system.

In case it is necessary to supply water from the mains of a water system which is known to be satisfactory to some other system using water of unsatisfactory sanitary quality, the method of supplying water to such a system shall be as follows:

By means of a pipe delivering the water to a tank or reservoir on the other system. This pipe shall be so installed that the water will be discharged into the tank or reservoir from an elevation of at least 6 inches above the rim of the tank.

SEWERAGE DESIGNS

The following is a brief statement of some of the

undesirable features which should be avoided in the design of sewerage systems, since they have been found to be unsatisfactory. Due to the relatively long Minnesota winters, it is necessary to design sewage treatment plants on a different basis than would be used in milder climates. Plans which show undesirable features and which do not comply with the following requirements will not be approved except when some valid reason is offered for doing otherwise.

1. Sewerage systems of the combined type, removing both domestic sewage and street drainage in the same pipes. Pipe collection systems, with rare exceptions, shall be of the separate type. The sanitary sewers shall be designed to remove house sewage and basement drainage only. All street and roof drainage shall be excluded from the sanitary sewers. A liberal allowance shall be made for ground water, depending upon local conditions.

2. Sewer pipes with grades which are less than those given in Table A shall not be used unless absolutely necessary.

Table A	
Size of pipe	Grade (Fall in feet per 100 feet of sewer)
6 inch	0.60
8 "	0.40
10 "	0.29
12 "	0.22
18 "	0.16
20 "	0.12
24 "	0.10
24 "	0.08

If it is necessary in any case to use grades less than these given in Table A, a written statement explaining the reason for using such grades shall accompany the plans, and flush tanks shall be provided at the upper ends of all lateral and main sewers which are laid with grades less than those shown by Table A. In no case shall grades be used which are less than those shown in Table B. Engineers are cautioned against specifying pipes of sizes which are obviously larger than necessary for carrying capacity, but which are used in order to meet grade requirements.

Table B	
Size of pipe	Grade (Fall in feet per 100 feet of sewer)
6 inch	0.33
8 "	0.25
10 "	0.23
12 "	0.20
15 "	0.16
18 "	0.12
20 "	0.10
24 "	0.08

3. Manholes spaced too far apart, or omitted entirely. Manholes shall be provided at all street intersections. Whenever the length of a sewer between any two street intersections is more than 500 feet and less than 700 feet, a lamphole shall be located midway between the intersections. Wherever the length of a sewer between any two street intersections is more than 700 feet, a manhole shall be located midway between the intersections. Lateral and trunk sewers shall be laid with a minimum cover of 6 feet wherever possible. This does not apply to outfall sewers.

4. Sewage treatment plants designed without some knowledge of the amount of sewage to be

treated. In case of an entirely new system, the sewage treatment plant shall be designed on a basis of the average rate of flow of sewage of not less than 60 gallons per capita nor more than 100 gallons per capita per 24 hours for the number of persons for which the plant is designed. Where sewage treatment plants are to be installed in connection with existing systems, measurements on the dry weather flow of sewage shall be made. The number of house connections shall be ascertained and a record made of the number of houses in the sewer district. This information shall be submitted with the plans.

5. Sewage treatment plants without by-pass pipes. It is often necessary or desirable to temporarily pass the sewage around all, or some part of the plants. In every case where a plant is installed to treat the sewage from a system of the combined type, the excess storm water shall be excluded from the plant by means of overflow or leaping weirs.

6. Screen or grit chambers, if required as a part of the sewage treatment plant, should be relatively small and designed so that the screenings and grit can be easily removed by the operator. The grit chamber should not be large enough to permit material to deposit which should be carried into the settling tank.

7. Imhoff tanks should be designed so as to provide for an average period of sedimentation of between two and three hours. The sloping walls of the settling chamber shall have a minimum slope of 1.0 horizontal to 1.2 vertical and shall be finished smooth. A steeper slope is preferable. The settling chamber should be approximately $1\frac{1}{2}$ to $2\frac{1}{2}$ times as long as it is wide, and the depth from the surface of the water to the slots should be approximately equal to the width of this chamber. Baffles should extend across the settling chamber near the inlet and the outlet ends. The inlets and outlets should be so located as to distribute the flow equally across the entire section of the settling chamber. Inlet and outlet pipes shall be designed to be self cleaning under all conditions. Weirs should be relatively narrow and adjustable. The slot or slots between the settling chamber and the sludge compartment should have a clear opening of at least six to eight inches. The overlap, or horizontal projection at the slot, or slots, should be at least four inches. Tanks with two or more sludge chambers in series shall be of the reversible flow type.

In cases where the pipe collection system is of the separate, or sanitary type, the sludge compartment shall have a capacity of at least two cubic feet per capita for which the plant is designed. Where the plant is designed to treat the sewage from an existing sewerage system of the combined type, the sludge compartment shall have a capacity of at least 50 per cent. larger than would be required if the system were of the separate type. In computing the size of the sludge compartment, only that portion of the sludge chamber shall be considered which is below a horizontal plane located two feet below the slot, or slots, in the bottom of the settling chamber, and above a surface developed by a line drawn at an angle of 30 degrees with the horizontal drawn from a point at the bottom of the sludge chamber 8 inches below and directly under the lower end of the sludge removal pipe. Suitable pipes for conveying water

under pressure to the sludge compartment for the purpose of agitating the sludge shall be provided. Water under pressure for use with a hose shall be provided. In case the plant is located where water from an established water supply system cannot be furnished conveniently, a pump may be installed to pump clarified sewage from the settling chamber, or some other convenient point. This pump should have a capacity of at least 50 gallons per minute when pumping against a pressure of 40 pounds per square inch.

In order that the operator can have free access to the tank, it should be designed to be entirely uncovered during the summer months, except when tanks are enclosed in buildings. Light, easily handled, wooden covers should be provided for winter use. If it is considered necessary or desirable to provide a building over the tank, the building shall have sufficient clear head room so as not to interfere with the operator of the plant. The clear head room below all obstructions above the surface of the water shall be at least 4 feet more than the distance from the surface of the water to the slots. Eaves shall not project over the vents to such a distance that a pole cannot be thrust into them to the bottom of the tank. Sludge removal pipes shall be straight and shall be from 6 to 8 inches in size. They shall be so designed that a rod can be introduced into the pipes for the purpose of agitating the sludge, and to facilitate its removal. The sludge should be discharged by gravity to the drying bed wherever possible. The available head on the discharge pipe shall not be less than 4 feet. A greater head is preferable. If it is necessary to remove the sludge by pumping, the pump shall be located at an elevation at least 4 feet below the surface of the water in the tank. Provision shall be made for replacing the sludge in the sludge pipe with water after it has been used in removing sludge from the tank. This is to prevent the sludge pipe from becoming filled with stiff sludge which will be hard to remove. The type of sludge pump shall be specified.

8. The sludge drying bed should be located as close as possible to the Imhoff tank in order that the sludge removal pipe may be short. If it is necessary to locate the sludge drying bed at any great distance from the tank, the sludge shall be conducted to the bed in an open trough. The surface of the sludge drying bed shall be from 18 to 24 inches below the outlet end of the sludge removal pipe. The sludge drying bed should have an area of approximately one square foot per capita for which the tank is designed. It shall be curbed to prevent earth from washing into it, and should be adequately underdrained. Due to the fact that sludge which has been drawn from the tank to the drying beds is often rained upon before being completely dried and ready for removal, it is suggested that the beds be covered. The roof over the beds should be at least 8 to 10 feet above the surface of the beds so as not to interfere with the removal of the sludge. The sides should be open.

9. Percolating filters should be conservatively designed as to capacity. Filters may vary in depth from 5 to 9 feet. The rate of flow depends somewhat upon the depth of the filter and the size of the filter material. An average rate of flow of about

1,200,000 to 1,500,000 gallons per acre per day for a filter 6 feet in depth is recommended for Minnesota conditions. Filters should be uncovered except where the sewage must be filtered during the winter months. The sewage should be distributed onto the filters by means of sprinkling nozzles.

10. A resettling tank having an average holding period of about one hour shall be installed wherever percolating filters are used. This tank shall be provided with cross baffles. The bottom shall be hopper shaped. Adequate provision for sludge removal shall be provided in accordance with the requirements for the removal of sludge from Imhoff tanks. The sludge drying bed shall be constructed in a manner similar to the bed for drying the sludge from Imhoff tanks. This bed shall have a net area equal to at least one-half a square foot per capita.

11. The entire plant should be surrounded by a substantial fence for the purpose of keeping out unauthorized persons, or animals.

12. Sewer outlets into streams, or lakes, shall be so designed that the sewage will be discharged under water wherever possible. Wherever the sewage is discharged into streams, it should be discharged directly into the main current. If discharged into a lake, the sewer outlet shall be at least 50 feet into the lake from shore, or farther if necessary to obtain a sufficient depth to prevent freezing of the outlet pipe, and at a point as far as possible from bathing beaches and waterworks intakes. Sewer outlets shall be suitably protected against damage by high water, or ice, by the use of bulk heads, or rip-rap or both.

Construction of Loch Raven Dam*

By Wm. A. Megraw

Methods and equipment used in mixing and placing the concrete. Fastening the face forms in place. Inventory of Contractor's plant. Cost of the work.

MIXING AND PLACING CONCRETE

Water for the concrete is taken from the river above the dam and measured by two barrels pivoted on their centers and so placed that each will empty into a mixer by hand. Each barrel has a 2½-inch quick-opening valve and a mark on the inside to indicate the quantity of water desired.

The sand and stone bins each discharge through a separate chute to a hopper located over a concrete mixer, the hopper being calibrated to measure the quantity of sand and stone required for one batch of concrete and designed to dump all material simultaneously into the mixers. Two one-yard mixers have been used, a Smith tilting mixer and a Ransome non-tilting mixer. For work of this character, it developed that the Smith tilting mixer gave better results than the Ransome non-tilting mixer.

The concrete is elevated from the mixers by

*Continued from page 439.

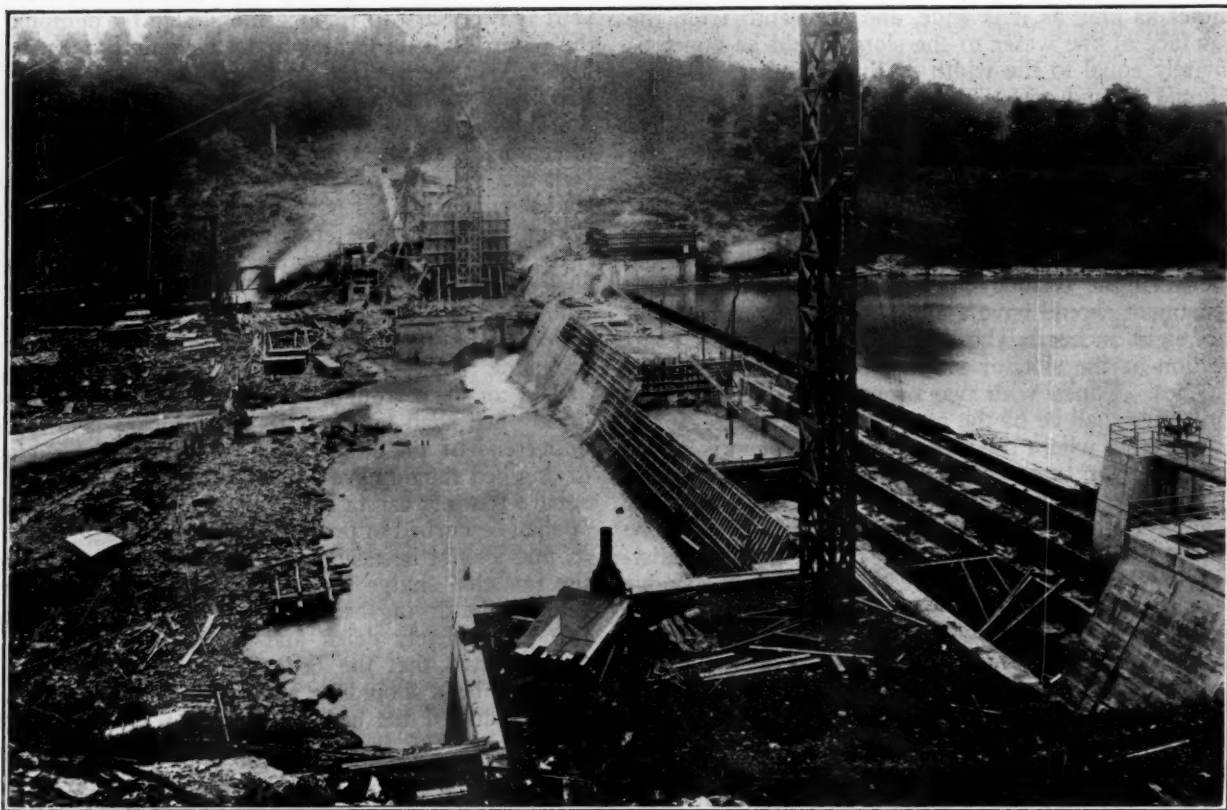


FIG. 1.—VIEW OF LOCH RAVEN DAM CONSTRUCTION, LOOKING TOWARD WEST END
At extreme left background is trestle carrying rock cars to crusher. At right of crusher are aggregate bins, with mixers below, and tower. In the foreground is the secondary tower for distributing concrete to the east end. Face and joint forms are seen in place, with top of old dam in the foreground.

buckets operating inside of a double wooden tower 204 feet high and is distributed by chutes to the desired points. The concrete buckets are raised by engines, one for each bucket, located at the elevation of the highway about 76 feet above the bottom of the lower pit.

The dam is built in 60-foot lengths, separated by transverse expansion joints extending continuously through the cross sections; 5/16 inch by 12-inch vertical steel plates, placed 18 inches back of the upstream face, being used to seal the expansion joints. The up-stream face of the dam is composed of 1-2-4 concrete placed in 8-foot lifts extending alternately 6 feet and 7 feet back from the face. The remainder of the section is composed of 1-3-6 concrete. The following concreting procedure generally was followed:

First, a lift of 1-2-4 concrete, 60 feet long between expansion joints was deposited. After twelve hours, the forms were removed and 1-3-6 concrete was then deposited in one operation from the back of the 1-2-4 concrete to the down-stream face and for a full length between expansion joints. The 1-3-6 concrete was generally brought 1 foot higher than the 1-2-4 concrete. The two grades of concrete thus break joints both horizontally and vertically, and the only vertical joints, except the expansion joints, are those between the two grades of concrete.

Six-inch by 12-inch horizontal bonding grooves 2 feet back of the front face, and a 14-inch by 14-inch porous block drain 2 feet further back from the face, were placed in the 1-2-4 concrete at the completion of each lift. The bonding groove and groove

for the tile drain were cut out by hand as soon as the concrete had sufficiently hardened. The ends of the tile drain are covered with burlap dipped in tar, and the space between the tile and groove filled with dry sand. At each expansion joint, the porous drain enters a 3 x 3 foot well that extends vertically upward and downward to galleries respectively above and below the highest and lowest horizontal joints, by means of which inspection can be made of the seepage through the dam. The lower gallery is drained into the tail water on the downstream side. Vertical bonding grooves 2 feet wide by 7 feet deep and 10 feet apart, bond the masonry across the expansion joints.

The 1-2-4 concrete shown on the plans for the downstream face was omitted and 1-3-6, deposited as described above, was substituted. The placing of forms on the downstream face presented a problem. There was no way of supporting them from the interior without leaving considerable timber in the concrete, and supporting them from the outside would have been expensive. The problem was solved by wiring the forms to dowels inserted in the existing concrete. A few props held the forms in place ready for pouring. As the concrete was deposited, the pressure soon became sufficient to keep the forms from collapsing, and the props were then removed. It was necessary to drill holes in the old foundation concrete for the dowels, but above that elevation, at the end of each day's pour as soon as the concrete had set sufficiently, pieces of scrap pipe were put in place to serve as dowels.

In the gate chamber one 24 x 24-inch and eleven

6 x 3.5-foot gates were placed. The specifications provided that all gates be securely blocked and fastened in position before concreting. The gates will be operated by stems varying in length from 50 feet to 75 feet and were required to be set exactly plumb, but as each gate weighs 4,700 lbs., it was practically impossible, with the means available, to sustain them in place while concreting around them. In construction, therefore, the bolts for the gate frames were set as the concrete was deposited and the gates and gate frames were set after concreting of the gate chamber had been completed.

The rock stratification on the east hillside is so much inclined from the horizontal that it was impossible to expose a large face without causing a rock slide. It was possible, however, by stepping the foundation, to keep a rugged wall of rock against which to place concrete. About 2,000 yards of solid rock was estimated, but owing to the sliding ten-

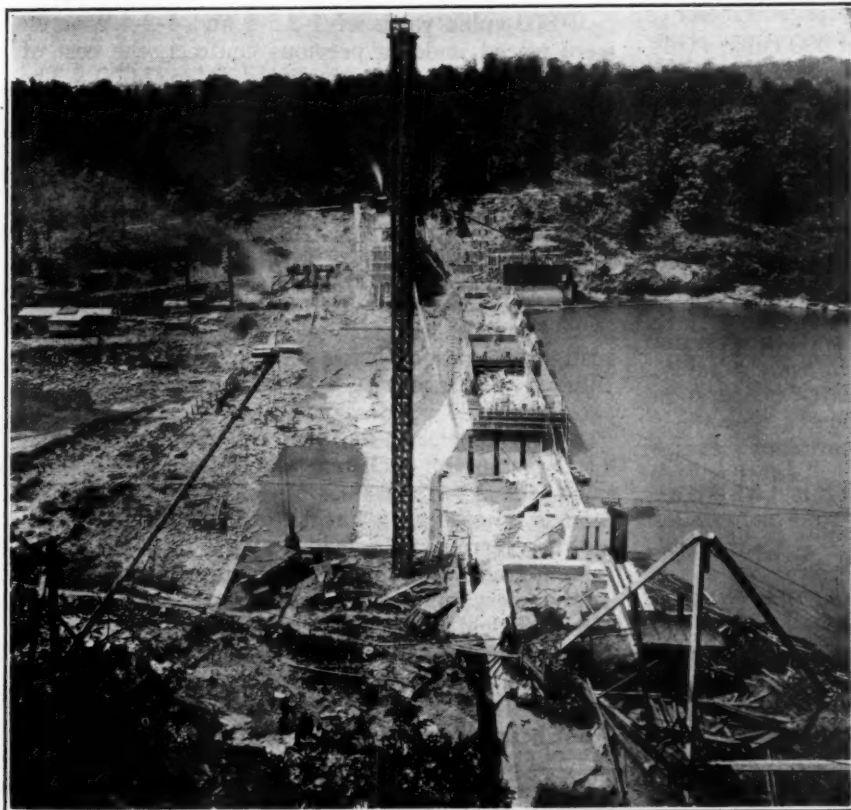


FIG. 2.—LOOKING TOWARD WEST END THREE WEEKS AFTER DATE OF FIG. 1. SHOWS VERTICAL BONDING GROOVES AT EXPANSION JOINT.



FIG. 3. ROCK SLIDE AT FURTHER END OF DAM.

dency, over 5,000 yards was excavated. Excavation for the east abutment was started before completion of the construction plant, yet, due to the difficulties encountered, this portion of the dam was the last completed.

CONTRACTOR'S PLANT

In order to convey concrete from the mixers on the west side of the river to the easterly part of the east abutment, the concrete was rehandled at the east tower. An elevator bucket within the tower was filled from the line chute, then elevated, and the contents emptied into a second chute higher on the tower. The east tower is 168 feet high and the west tower 204 feet high. The towers are 340 feet apart and connected by a $1\frac{3}{4}$ -inch cable which carries the concreting chute.

The capacity of the plant is about 600 cubic yards of concrete per 10-hour day, although at times 700 cubic yards have been placed in that time. The average per working day was 300 cubic yards. A considerable portion of the contractor's plant had been used before, but the loss due to breakdowns was not excessive. The records of the resident engineer show a loss of 483 working hours. Of this time, 48 per cent was due to breakdowns and other troubles with the mixers, 22 per cent to changing and clogging of chutes, 14 per cent to accidents in the towers, and 15 per cent to lack of forming space and other causes. On the whole, the work progressed with rapidity, which was due in part to the hearty cooperation between the contractor and the engineers.

The following is a list of the contractor's equipment:

- 1—Marion 31 revolving steam shovel.
- 1—Erie type "B" revolving steam shovel.
- 1—Marion 61, railroad type, steam shovel, gasoline pumping outfit.
- 1—18-ton Vulcan narrow gauge dinkey.
- 1—14-ton American narrow gauge dinkey.
- 10—Koppel 4 yd. dump cars.
- 10—Western wheel scraper 4 yd. dump cars.
- 1—325 cu. ft. Ingersoll-Rand steam driven air compressor.
- 1—160 cu. ft. Chicago Pneumatic Tool air compressor.
- 1—Bull Dog 20" gyratory crusher—rated capacity 1,500 tons 10 hrs.
- 1—175 h.p. horizontal Corliss valve steam engine, driving crusher.
- 1—24" rock bucket elevator.
- 2—20" belt conveyors—1 driven by 12 h.p. vertical steam engine, and 1 by 12 h.p. Otto gasoline engine.
- 1—Link belt sand washer.

- 1—Steam driven duplex pump, 6" suction, 5" discharge, for general water supply.
- 2—Duplex boiler feed pumps.
- 1—15,000 gal. wooden tank for water supply.
- 1—150 h.p. locomotive type boiler.
- 1—150 h.p. Scotch marine boiler.
- 1—60 h.p. vertical boiler.
- 1—30 h.p. vertical boiler.
- 1—Ingersoll-Rand drill sharpener, air operated.
- 1—Circular saw.
- 1—Band saw.
- 1—Grinder.
- 1—Power operated pipe-threading machine.
- 1—Contractor's equipment 7, $\frac{1}{2}$ " x 10" double-drum hoisting engine with boiler.
- 1—3-drum, 8 x 12 Mundy hoist with boiler.
- 1—8 $\frac{1}{4}$ x 10 double-drum Lidgerwood hoist with boiler.
- 1—8 x 10 Lidgerwood hoist with boiler.
- 1—5 x 8 double-drum hoist with boiler.
- 1—7 x 10 American double-drum hoist with boiler and boom swinger.
- 1—8 $\frac{1}{2}$ x 10 double-drum Lambert skeleton hoist.
- 1—6 $\frac{1}{2}$ x 12 double-drum Mundy hoist.
- 1—Stiff-leg derrick 15T capacity with 65 ft. boom.
- 1—" " " 15T " " 60 " "
- 1—" " " 5T " " 50 " "
- 1200 linear ft. of Lakewood chutes.
- 2 No. $3\frac{1}{2}$ Keystone well drills.

COST OF THE WORK

About 45,000 yards of concrete are required under the present contract, and the cost of all items will amount to about \$525,000. The principal unit prices are as follows:

Loose rock excavation.....	\$ 4.69	per cu. yd.
Solid rock excavation.....	6.67	per cu. yd.
Concrete for balustrades.....	20.60	per cu. yd.
1-2-4 mass concrete.....	11.85	per cu. yd.
1-3-6 mass concrete.....	10.34	per cu. yd.
Steel reinforcement0434	per lb.

50,800 cubic yards of 1-2.5-5 and 1-2-4 concrete were placed under a previous contract, the cost of all work under which amounted to \$527,000. The total cost of the dam from bottom to top is, therefore, \$1,052,000.

The writer is indebted to C. K. Allen, resident engineer, for a portion of the information contained in this article.

The Bates Experimental Road

A few weeks ago we described the result of the second run of the test of the Bates experimental road, which test is being conducted by the state of Illinois. A third test was completed a few days ago, and will be described in the next issue of PUBLIC WORKS. In the third test the trucks carried 4,500 pounds on each rear wheel for 3,000 applications. A fourth test is to be made with 5,500 pounds on each rear wheel for 3,000 applications.

We referred in a previous article to the fact that the subgrade of this road was quite wet, thus presenting very unfavorable conditions. W. P. Blafr, vice-president of the National Paving Brick Manufacturers' Association, after visiting the road a few days ago, reported that: "Water has disappeared entirely from the side open ditches and is oozing from beneath only one section of the pavement, so far as I was able to observe. On a previous inspection water was oozing from beneath all sections of the pavement. It may never become known to what extent the water in the various sections has contributed to the injury of the pavement thus far observed."

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CONTENTS

IMPROVING EAST OHIO STREET, PITTS- BURGH. Illustrated	455
DON'TS FOR SEWERAGE AND WATER WORKS DESIGNERS	457
CONSTRUCTION OF LOCH RAVEN DAM. Illus- trated. By William A. Megraw.....	460
The Bates Experimental Road.....	462
EDITORIAL NOTES	463
State Advice on Sewer and Water Designing— Arbitration of Contract Disputes.	
SETTLEMENT OF SOILS UNDER LOADS.....	464
STREET CLEANING PERFORMANCE AND COST DATA. By Zara Witkin.....	465
SEWER TRENCHING IN RUNNING SAND.....	467
Federal Aid Bill a Law.....	468
Brick Roads in Indiana and Illinois.....	468
RECENT LEGAL DECISIONS.....	469

State Advice on Sewer and Water Designing

The majority of states now have sanitary engineers or sanitary engineering departments connected with their state health boards and these generally exert more or less control over the construction of sewer and water works systems throughout the state. In the majority of cases, probably, the state health board engineer confines himself to approving or disapproving plans submitted, although he is generally ready to consult with the designing engineer before he begins preparing his design with a view to informing him whether the general plan which he proposes to follow will be acceptable.

A few of the states go further than this. Minnesota has prepared and published a quite extensive statement of features that are to be avoided in designing water works or sewer systems, and these instructions are published elsewhere in this issue. It will be noticed that these confine themselves, in the case of water works at least, exclusively to features affecting the health of the community.

Under the head of sewerage designs the board seems to go a little further and insists on adequate grade to the sewers so that stoppages may be reduced to a minimum, and the use of flush tanks wherever low grades are used. The greater part of the in-

structions in connection with sewerage, however, are for the designing of sewage treatment plants and especially Imhoff tanks. It would almost seem as though the instructions for these went unnecessarily far in specifying details of the design.

There are advantages in informing designing engineers beforehand just what the state board will require in its designs, so far as these can be specified beforehand. There is danger, however, as has been illustrated by the history of state health board oversight in one or two of the states, that the establishing of rules of this kind may retard progress in that the board hesitates to change rules which interfere with the introduction of new ideas on the subject, until such time as they are absolutely certain that these new ideas are sound—that is, until other states less conservative have permitted their cities to try out these ideas and demonstrate their acceptability.

It seems to us undesirable that health boards should act as a brake to the wheels of progress, but that it would be best should the board confine itself to seeing that plans as adopted are not antagonistic to the health of the citizens of the state, permitting the cities themselves to decide all questions of finances connected with the construction of their sewage treatment plants or other features of sewerage systems, and even to take occasional chances in testing out new ideas. If all the cities in all the states should be barred from trying anything new, all progress in sewerage and sewage treatment would be blocked indefinitely.

Arbitration of Contract Disputes

The contract and specifications for construction work are or should be instruments intended solely to determine, with the drawings, what the engineer and owner wish to purchase, how and with what it must be produced and the manner and amount of payments, thus affording opportunity for the meeting of the minds of both parties to the contract and the definite statement of their mutual obligations.

It is generally provided that the owner's engineer shall be the final authority in the interpretations and decisions, which is the simple and natural procedure, providing all parties are fair-minded, competent and reliable.

It is, however, entirely possible that unforeseen conditions and developments may arise that cannot be properly provided for in advance by the contract and specification and should certainly be subject first to conference and agreement between the parties of the contract and afterwards, if necessary, to impartial decision by a third party. A general clause providing for this can easily and properly be inserted in every contract and if present should not be protested by any fair-minded person.

In the case of a large amount of construction work in Louisville, mentioned on page 464 conditions were such that all the principal contractors demanded in advance provision for arbitration and refused to consider the work without it. We do not know what conditions impelled this action, but, obviously, some reasons for dissatisfaction were felt to exist and the fact that they were so potent before the commencement of the work lends color to the possibility of justification of their demand, because of the refusal of the owner's attorney to consent to arbitration.

Under a considerate and impartial supervision and investigation of specifications, the necessity for arbitration will be felt and when it occurs it should be cheerfully and thoroughly accepted by both parties. The denial of this fundamental provision which should be equally beneficial to both parties is of itself suspicious and it is to be hoped that the contractors will continue to refuse to undertake work in which there is any reasonable grounds for expectation of unfair treatment. Occurrences of this sort afford opportunity for important and desirable investigations and recommendations by the local and national associations of the contractors, engineers and lawyers.

Settlement of Soils Under Loads*

**Large machine recommended by
the American Society of Civil
Engineers as standard for making
tests.**

The proposed standard large type of load testing apparatus for soils recommended by the committee of the American Society of Civil Engineers was used, practically without modification, for tests made at the site of the Standard Oil Office Building, San Francisco, by Frank A. Johnson and by the city of Seattle, Washington, A. H. Dimock, city engineer and F. A. Rapp, bridge engineer.

In the San Francisco test two record boards in planes at right angles to each other were installed and the average of the readings, which differed little from either one, was used. The hopper was loaded with sand, but it was considered that a water load would have been preferable because great care was necessary in applying the sand increment and because a light jar of the hopper was transmitted with greater intensity to the post. It was suggested that the use of burlap under the compression plate was desirable to resist the tendency of the material to squeeze out from under the compression plate. The total cost of these eight tests, including cost of material and labor, was only \$321.

Tests were conducted in positions varying from 12 inches below water level to 18 inches above water level; loads were added by one thousand pound increments and the ultimate settlement for a maximum load of 16,000 pounds after an elapsed time of about 19 hours varied from less than 1/2 inch for test No. 7 made 9 inches below water level, to 2 1/4 inches for test No. 2 made about 12 inches below water level. The soil was alternate strata of sand and clay of different qualities. The tests indicate the sensitiveness of the apparatus and that the settlements are uniform in character and reveal the elastic nature of the soil.

The essential features of the testing machine are: A bearing plate, compression post, adjusting screw, balance beam, ballast hopper, counterweight, saddle

beam with anchorages, and the necessary recording device. They should be used in the following manner:

After erecting the anchorage boxes and saddle beam, the boxes should be filled and the balance beam put in position and balanced, with the hopper in place, by filling in the counterweight box. After excavating a test pit (using breasting boards, if necessary), the bottom should be carefully leveled, and the bearing plate placed in position by plumbing down from the plate on the balance beam. The section of sewer pipe should then be placed and carefully back-filled.

The compression post may then be placed, the screw adjusted, and the recording device attached. This consists of a board, on which is tacked a sheet of paper, and a light straightedge hinged near the edge of the board. A vertical line is ruled on the paper, at some fixed ratio of the distance from the axis of the straightedge to a nail driven in the compression post. At the start, and as weight is placed in the hopper, lines should be drawn along the straightedge and the time and weight recorded. The balance beam should be kept level, as the post is depressed, by means of the adjusting screw.

The hopper may be calibrated and a scale attached for direct reading of the weight. Either dry sand or water may be used, and provision made near the bottom of the hopper for drawing them off. All contact points should be coated with heavy grease.

Contractors Boycott Sewer Specifications

The Commissioners of Sewerage for the city of Louisville, Kentucky, invited bids for one million dollars worth of sewers, bids to be opened May 23rd. On that date no bids were presented because the contractors took exception to a clause of the specifications which provides that the commission engineer's estimates and decisions shall be final as regards amount, quality and acceptability of the work, and conclusive upon both parties. The contractors insisted that disputed points should be passed on by an arbitration board and not by the commission engineer representing one party only of the contract.

Later, the contractors, after several conferences with the commission, agreed to execute the orders and directions of the commission's engineer without question provided that their claims for compensation were heard by a jury. This arrangement was accepted by the Commission but the Commission's attorney, William Crawford, refused to revise the contract and specifications and the Commission again proceeded, without eliminating the objectionable clauses, to advertise for bids to be opened June 23rd.

The latest advices indicate that the contractors will again refuse to bid and they have requested the Commissioners of Sewerage to join them in asking the courts, under the new Declaratory Judgment law, to interpret the objectionable clause.

D. R. Lyman, secretary of the Kentucky Association of Highway Contractors, has given full publicity to the statement that the contractors' fight is against unfair conditions and if successful, will be beneficial to both the contractors and the general public and that Kentucky asks and expects to receive the national co-operation of contractors.

*Abstract of the progress report of the special committee to codify present practice of the bearing value of soil for foundations, etc., presented to the annual meeting of the American Society of Civil Engineers, January 15, 1922, and published on page 523 of the proceedings, Volume 18, No. 3, March, 1922.

Street Cleaning Performance and Cost Data

By Zara Witkin*

Advantages of linear performance units over present areal units in securing accurate data

Accurate performance records would furnish a tremendous stimulus to more efficient street cleaning. They would permit significant work and cost comparisons which are the bases of progress in any field. To develop such records, performance units must be employed which accurately represent the work actually done. The present type of areal units does not do this, and often tends to mask the performance instead of evaluating it.

A considerable amount of energy is spent in exploring the lack of accurate street cleaning performance records and cost data available for comparative purposes. This "deploring" energy will be much better utilized when transformed into "exploring" energy. Exploring actual methods of street cleaning reveals possibilities for greater accuracy by the use of *linear* units of performance. While street surfaces are areas, and cleaning is assigned to be done on these areas, the various cleaning methods take the form of *linear motion along a street*, and a more rational measure of the work is therefore obtained in terms of such linear distance swept or flushed, etc., as the case may be.†

It is suggested that records of the same performance be kept in both areal and linear units for comparison. Observations of this kind have shown greater consistency for the linear units. It is believed that further tests will demonstrate their superior adaptability.

The use of such units supplemented by data on the conditions and quality of service would establish comparative performance and cost data of wide application and considerable value.

Certain discrepancies between actual performance by various street cleaning methods and the usual records of the work are shown below as compared with the advantages of the proposed linear records.

The Present Unit of Performance

The usual method of recording a street cleaning performance is in terms of the number of thousand square yards cleaned. This is computed by taking the entire area of the street from gutter to gutter for the length over which cleaning is done. The areal unit is applied to all types of cleaning services, including hand sweeping, machine sweeping, hand flushing, machine flushing, squeegeeing, and vacuum cleaning. What the area really means is the *area assigned for cleaning*. It is usually very different from an areal measure of cleaning done.

Discrepancies in Recording Quantity of Work Done by Different Cleaning Methods in Areal Units

General Conditions.—The distribution of dirt on a

street follows certain general laws. The amount on the central area is very small compared to the amount in the gutters. Usually the wind and the suction effect of traffic are major causes of this difference. Where there is a prevailing wind, one gutter is 'heavier' or dirtier than the other. Therefore, on any given street, irrespective of the absolute amount of dirt, the relative work of cleaning one square yard of area in the center is very different from that involved in cleaning a square yard of gutter area. Summing up a combination of such widely differing dirt areas on the same street produces a total of questionable meaning.

Methods.—1. Hand sweeping, whether done by gangs or by blockmen, in actual practice never covers the entire area of the street but is confined to sweeping the gutters with occasional pick-ups of dirt deposits in the central area of the street. The width of the gutter strip swept usually varies from one to six feet. The implication that hand sweeping is done on the entire area of the street is quite contrary to fact.

The width of a street, which has little influence on the amount of actual work required to clean the street, nevertheless considerably affects the *amount of work which the records indicate as performed*.

2. In machine sweeping, either horse-drawn or motor-driven, the service sometimes performed by this equipment is the sweeping of gutter strips wider than in the case of hand sweeping, but excluding a considerable part of the central area of the street.

3. Vacuum cleaning, where employed, does not always cover the entire area of the street, and is then supplemented by gutter sweepers or gutter sweeping machines. In this case it is sometimes the practice to give complete credit to the main machine for the entire area cleaned.

4. The effect of areal units as used in the customary manner to describe the performance of flushing equipment, is frequently misleading, the actual service being very difficult to determine from the records. Flushers may make from one to four, or even more trips over a single length of street, with the corresponding variations in cost, time and cleaning service, but the usual record will show the same number of square yards "flushed" for both extremes and all intermediate amounts of service.

Different Cleaning Methods Do Not Do the Same Work.—It must further be borne in mind that the services of various kinds of equipment and manual cleaning are not strictly comparable. They are in some cases supplementary and rarely do similar work. For instance, hand sweeping removes large fragments, paper, horse droppings, cigar butts, etc. from the surface of a street, but leaves the fine dust untouched. Flushing machines do not remove any dirt completely but force a certain percentage of the fine dirt and lighter fragments into the gutters where some is carried by the stream of water into catch-

* Engineer, San Francisco Bureau of Governmental Research.

† That this type of unit has been utilized to advantage is borne out by the reference made later to the hand-sweeping performance rates of the Chicago Civil Service Commission Report of 1913. W. H. Nanry, formerly Engineering Examiner (now Director) of the San Francisco Bureau of Governmental Research, also used linear units for all street cleaning methods in recording field observations on performance of the San Francisco Street Cleaning Bureau in 1919.

basin inlets and the rest deposited in the gutters. Horse droppings and heavy fragments are not scoured away by flushing machines. Hand sweeping and flushing are, then, supplementary services, and for the highest quality of cleaning should both be applied to a given street surface. Vacuum cleaning removes a larger percentage of fine dust than does flushing but cannot well be applied to rough, uneven pavement. Machine sweeping is used on relatively dirty streets, but does not remove the fine dust and must be supplemented for thorough cleaning purposes.

These important differences in the services rendered by the various methods of cleaning make indiscriminate comparisons, on the basis of theoretical areas cleaned, of little meaning.

Cost Records

The ordinary "20 cents per thousand square yard" manner of stating street cleaning costs scarcely complies with the principles of compiling cost data.

Including, as it does, the sources of error pointed out above, such a 'unit cost' tells us little more than the statement that "*cloth costs 25 cents per yard*" without adding the kind of cloth, the quality, width, and points of manufacture and delivery. Comparison, for instance, between hand sweeping done in one locality on uneven block pavement by men paid at a certain daily rate, with machine sweeping on smooth pavement by equipment operating at a different daily cost in another locality should not be made without explicitly and fully giving these particulars. The principle of comparison is sound. The weakness is in the scanty records.

The significant elements of cost data in street cleaning methods which should form part of the records are:

1. Labor, daily wage.
2. Length of working day.
3. Price of equipment new, price of replaced parts.
4. Price of unit wear and use (tire mileage cost, gasoline and oil consumption, repair, depreciation, etc.).
5. In case of hired equipment, the rental cost.

These facts light up a cost statement and make it intelligible. With full detail and an accurate record of performance, cost comparisons become of the greatest value.

The Proposed Linear Units

As a basis for accurate records, the use of linear units is suggested.

For hand sweeping, a unit of 1,000 single-gutter-feet or 1 single-gutter-mile swept is useful and practical. The application of this linear work unit was realized, and its principle adopted by the Chicago Civil Service Commission in its investigation of street cleaning in that city in 1913. The report of this study gave the average performance of a hand sweeper in the spring clean-up in "*single-gutter-miles per day*."

Machine sweeping performance similarly is directly expressed by machine-distance, in machine-miles-swept, instead of an area theoretically covered. This linear measure affords direct speed comparison, lost time factors (if proper stop-start time records are kept) and builds up a continuing mileage total on the basis of which, broom wear, depreciation charges,

and gasoline and oil costs can be correctly pro-rated.

In stating flusher performance the linear unit is specially applicable. It gives credit to the machine for the actual flushing distance traveled, and for no more. If a 50 foot street is traversed once, and another street, 60 feet in width, is traversed twice, in one flushing, the difference in cleaning service can be readily understood and the relative costs shown. With the general type of record 20 per cent. more work on the 60 foot street would be shown, while actually the increase of work done over the performance on the 50 foot street is 100 per cent.

Hand flushing is practically the only type of street cleaning which cannot be best expressed in terms of linear work units. It is however, a little used method and has little effect on the general discussion.

Squeegeeing and vacuum cleaning machines are similar in use to flushers and the same considerations set forth above for flushers apply to records of their performance as well.

Statement of Conditions Affecting Work

While the general adoption of linear units for street cleaning performance would furnish a definite record of actual work done, these records could be supplemented by other data to indicate the conditions affecting the amount and distribution of street dirt and the quality and effectiveness of the cleaning service. Ordinarily such data are rarely given owing to their wide variations and accidental nature. But every element which can be explicitly stated eliminates just so much from the total of these undescribed conditions. The data for a given street which can be stated so as to reduce the "unknown constant" are:

1. Pavement.—Kind, condition, grade.
2. Traffic.—Density, kind (horse-drawn traffic is the critical value).
3. Presence of car tracks, etc.
4. District.—(Shopping, residential, etc.).
5. Weather.—Dry or rainy.
6. Frequency of cleaning (This is a significant standard of cleanness, since it measures the average time dirt lies on a street before being picked up).

A complete statement of such conditions would permit analysis of comparable performance of street cleaning with respect to the efficiency or organization, men, equipment and methods.

It may be objected that even the full data called for by these proposals would hardly put street cleaning records on a strictly scientific basis and that it is not possible to exactly define such variable and accidental factors as are encountered. This is true. But it is itself a strong argument for the greatest possible precision and systematization in compiling performance records. The whole movement of Scientific Management is based on such an attempt to analyze and codify factors to close approximations which cannot be exactly expressed. Every approach, however, eliminates a part of the uncertainty of the work.

If the peculiar difficulties in street cleaning are accepted as a challenge to engineering analysis, street cleaning practice will steadily advance to efficient, scientific service. The first step is necessarily the development of complete performance records, based on actual linear work units, as suggested above, rendering critical comparisons possible.

Sewer Trenching in Running Sand

Trenching machines likely to involve difficulties from interference with sheeting and bracing. Delayed sheeting or use of towed shield considered. Preliminary sheeting and hand or drag line excavation most promising.

June 6, 1922.

Editor PUBLIC WORKS:

Dear Sir:—

Will you kindly advise me as to the use of any type of excavating machine for sewer work in soil which is all sand, like running sugar when dry, and where it is necessary to shore tightly every inch of the way? The maximum depth is 15 feet and two stories of shoring will probably be used. It is impossible to have the sides of the ditch exposed long in the sun, for then it begins to cut out and fall in; the shoring material must be placed down a little at a time. The width of the trench will be about 6 to 7 feet.

We have always used all hand work on such work due to the conditions, and I am wondering if it is not better in most ways. The banks will positively not stand up without tight shoring. Much of our trench must hug close to curb lines, and be under trees with low hanging branches. The street is also filled with water and gas services.

Will you kindly advise relative to this matter?

Yours truly
City Engineer.

Since the ground is so loose and unstable, the use of excavating machines of the ordinary trench type is very much restricted and is likely not to be practicable. The width of your trench is also about up to the ordinary maximum width of trench machine excavators making a single cut and in such unstable soil two cuts would be very difficult or impossible. If the soil is dense enough so that the sides of the full-depth trench will stand up a few minutes after excavation, it may be possible to make a 6-foot cut and immediately sheet it with vertical planks, rangers and cross struts prepared in advance and placed, while driving, behind it.

Cases have been described where trenches were excavated in very loose soil by machines towing behind them a sort of shield moving in the bottom of the trench and affording support and protection for men laying and jointing the pipe as fast as the trench was opened and allowing the sides to cave in or be back-filled immediately after the shield passed. This, however, would imply omission of the sheeting and considerable possible disturbance of the soil adjacent to the trench, which would not be permissible in improved streets.

It is possible that a slight advantage might be secured by plowing along each side of the trench, in advance of the excavation, and filling it with water which, rapidly penetrating the soft sand, might dampen it enough to considerably increase its resistance to sliding for a short time after the excavation was made.

It would be desirable to communicate with the manufacturers of some of the several standard

trenching machines such as the Austin Machinery Corporation, Pawling & Harnischfeger, The Buckeye Traction Ditcher Co., Parsons Co., and others who will be glad to give you the maximum dimensions of trench that their equipment will excavate and advise you regarding the efficiency of the equipment under the conditions that you must encounter. Trenching machines are expensive and bulky and the cost of purchase, transportation and installation is heavy for a small job.

The amount of soil that you have to excavate and the rapidity with which it is required to do the work as well as the obstruction that is permissible in the streets are important factors in determining the methods to be pursued. Unless you can eliminate sheeting and bracing until after a given section of the trench is excavated to full depth, it will probably be inadvisable to attempt to use the ordinary trenching machine and the proposition will become one for most efficient sheeting, excavating, hoisting and back filling.

SHEETING IN ADVANCE

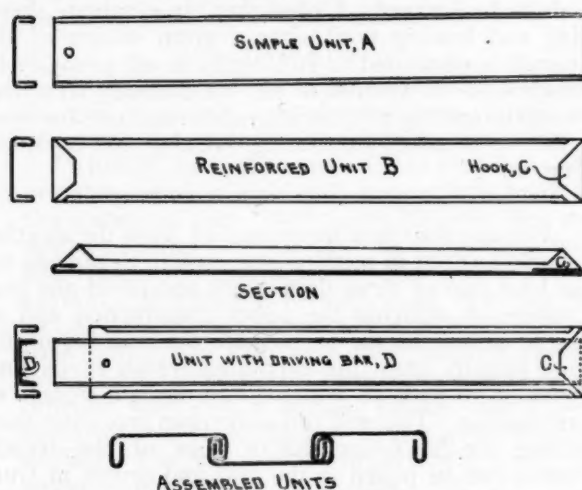
For any considerable amount of work the sheeting should be done in sections long enough to provide for at least two or three days' work and avoid any possibility of delaying the sewer construction and so as to permit as far as possible the transfer of the soil directly from the excavated trench to its final position in back-fill without intermediate storage or rehandling. This will probably mean providing sheet piling for 200 linear feet or more of the trench, which can be pulled in the rear and driven in front so as to use it over and over again as the work advances.

Driving by hand as the excavation is made is slow and costly and with modern facilities it is far better in an important piece of work to drive with power. This can be accomplished either with a sheet pile driving pneumatic hammer or with a hydraulic jet or with both combined. In loose sand a hydraulic jet of from 100 to 200 pounds pressure and a small flat nozzle will sink a 12-inch pile very rapidly and without injury and can easily be operated by a portable pumping outfit driven by a gasoline engine or electric motor. Much wider sheet pile units can be driven with two jets and the work may be facilitated by moderate use of a hand maul.

Two-inch wooden planks may be driven by either the hammer or the jet, but it is difficult to make satisfactory joints between the units and they cannot be interlocked and are liable to be injured by driving, pulling and re-driving. Steel sheet piles are much more easily driven because the displacement of material is far less than for wooden piles, they cut through the soil and obstacles more readily, the friction is less and they endure driving better. When properly handled in sandy soil they can be driven and pulled an indefinite number of times without material injury so that at the end of the job they have a high salvage value or are available for storage for future operations.

The sections of steel sheet piles available in the market are most of them heavy and costly for such work. One or two very light sections may be had but must conform exactly to the dimensions of the rolls and of course cannot be secured of extremely light weight or of varying strength and width.

A very efficient pile unit is made of 16-inch gage thickness, from 10 to 15 inches in width and with flanges from 1½ to 3 inches wide as required, will only weigh about 3 or 4 pounds per square foot; is very easily handled and driven, possesses great strength and has an unexcelled interlock, the material all being placed where it is theoretically most effective. The simplest unit is made like sketch A with a pulling hole in one end, and can be driven to a penetration of 10 or 12 feet in loose soil without jetting, but it is better to enforce both ends by bending the web double as in sketch B, greatly increasing the resistance to passing through obstacles and to the impact of the driving hammer.



Slip-joint Sheet Pile Units for Sheet-piling Trenches

In this case the lower end C is always available to act as a hook and to receive the foot of a channel bar D placed between the flanges of the pile unit and serving as a stiffening bar that enables the pile to be driven through very hard ground or through unexpected obstacles without injury and is afterwards removed and ready for driving the next unit. With this detachable bar, piles up to 15 or 18 inches in width can be driven to considerable depth without injury. By jetting, still greater widths can be used and two jets may be applied if desirable, thus sinking very wide units with or without the detachable stiffening bars. The wider the units the less the probable cost per square foot or per pound and the greater the rapidity of installation. They may be made of very thin sheets as ordered, of any required width and with any required width of flanges and after installation can be faced with loose boards or planks and braced as rigidly as required.

After the sheeting has been driven to full penetration on both sides of the trench the excavation may be commenced by any convenient method. If it is carried on by hand, the spoil can be handled by derricks to trucks or service cars alongside the trench or by cableways for immediate disposition as back-fill; or it may be loaded into buckets and carried along the trench to the back-fill point by some form of conveyor, such as the Potter machine, the Carson trench machine or by a homemade telfer installation.

The only kind of power excavation likely to be efficient in the sheeted trench is a dragline scraper that can be operated, if necessary, under the upper

tier of transverse braces that may be installed to support the tops of the sheeting.

Almost any type of standard scraper buckets, such as are made by Saverman Bros., Brown Hoisting Machinery Co., Hayward Co., and the Monighan Machine Co., may be utilized, or one may be improvised and operated with a direct hauling line and tail line handled by a suitable hoisting engine. The loaded buckets may be hauled out of the trench on a movable incline that raises it high enough to dump into a truck at street level or the incline could probably be arranged on a movable platform with a cover protecting the trench so that work could be carried on underneath it and the spoil dumped directly over the finished sewer for back-fill without rehandling.

If gas and water service pipes are located within the limits of the trench, it will probably be more advantageous to excavate by hand rather than attempt to use a power equipment.

Brick Roads in Indiana and Illinois

Contract for construction of the first brick road to be built by the state of Illinois since Governor Len Small's "\$30,000 a mile" edict went into effect, has just been let by the Illinois State Highway Department. While smaller political units in the state have been building brick roads right along, this is the first action of its kind on the part of the state highway department, under the present administration.

This follows closely a similar action on the part of the Indiana State Highway Department. Indiana, however, was one of the last states in the union to establish a highway department, and while many miles of brick roads have been built by the various counties in Indiana the recent contract by the state was the first since formation of its highway department.

The Illinois contract, let to J. E. Craine of Murphysboro, Ill., is for 13.32 miles on Route 2, sections 12 and 13, extending from Cobden to Dongola. Ill. Specifications provide for a base of 10 inches of novaculite, laid in two 5-inch courses, a 1½-inch sand cushion, 3-inch vitrified brick and asphalt filler. Curbs of compacted novaculite will be 12 inches wide and 4½ inches deep. The pavement will be 18 feet wide.

"Novaculite" is a trade name of a local material found in Southern Illinois which is a silica product, or what some engineers call disintegrated chert. It contains alumina and oxide of iron, commonly called "clay binder," and when rolled and compacted sets up hard with a cementing characteristic. Like crushed stone, slag, or gravel where available, it is looked upon as a good base material when a rolled base is desired.

The Cobden-Dongola road is a portion of one of the principal north and south highways of the state which, starting at Decatur, runs due south through Pana, Vandalia, Centralia, and Carbondale to Cairo, on the Mississippi river. When completed it will be one of the heavy traffic routes of the state.

In Indiana the recent brick contract was for a 6.89-mile section of the heavily traveled and widely known National Road. There, too, 3-inch brick and asphalt filler were specified.

Recent Legal Decisions

MASTER METER MEASUREMENT OF ELECTRIC ENERGY SUPPLIED BY MUNICIPALITY

The Village Board of Embarrass applied to the Wisconsin Railroad Commission for a revision of its rate and basis of billing for electric energy, sold by the village to a light and power company. The existing practice of the municipal utility was to bill the company at the rate of 8 cents per kilowatt hour on the basis of the reading of individual meters. The board asked that the reading of the master meter be fixed as the basis of billing.

Investigation showed that for five months, the master meter registered 2,910 kilowatt hours, and during the same period the individual meters supplying consumers of the light company registered 1,236 kilowatt hours, indicating a loss of 1,676 kilowatt hours, or 57.6 per cent. Data from six rural companies operating under similar conditions indicated that the weighted average loss was 56.1 per cent during 1921.

The Commission considered that the measurement of energy as a basis for computing the bills to the company should be made at the master meter, as requested by the municipality, but the characteristics of the load on this line where a very substantial part of the energy is lost in transformers make the service, in the commission's opinion, entitled to the regular power rate of the village, or 5 cents per kilowatt hour.

VALUATION OF UTILITY PLANT FOR MUNICIPAL PURCHASE

The California Railroad Commission, in proceedings for the acquisition by the city of Redding of an electric distribution system, that items of "appreciation in value," due to increased market prices, entering into the valuation of the plant since its valuation for municipal purchase, or into the allowance of severance damages, are not allowable under the provisions of the California Public Utilities Act.

CANCELLATION OF ROAD CONSTRUCTION CONTRACT DOES NOT RELEASE FROM PAYMENT OF BOND PREMIUM

The Indiana Appellate Court holds, *Rehm v. McCray*, 134 N. E. 505, that the action of a county board of commissioners in releasing a contractor for road construction and canceling his contract after accepting his proposal did not release the contractor from his agreement with the bonding company to pay the premium for the bond submitted, as required by statute, with his bid.

CHANGING CONTRACT RATES FOR WATER—VALUATION FOR RATE-MAKING

The Indiana Public Service Commission, in the case of the Sullivan County Water Company, holds that it has authority to change the rates of a water company, notwithstanding the fact that a city from which the company acquired the plant by purchase has contracted with it for certain maximum rates as a consideration of its transfer of the property, although the contract was made prior to the passing of the Public Service Commission Act. The Commission also holds that property which the water

company now has in use for public service must necessarily be considered in finding a rate base, even though property was obtained from the city, and the purchase price left partly unpaid, if such be the case, since the Commission does not concern itself with the question whether the consideration originally paid for any property was adequate or inadequate.

ORAL CHANGE OF CONTRACT TO FURNISH STONE HELD VALID

A city having contracted with an engineering company to build certain streets, the company contracted with a subcontractor to furnish the stone according to plans and specifications of the city, made part of the contract. The principal contractor subsequently agreed with the city to make changes in the contract which necessitated changes in the stone. In an action by the subcontractor against the principal contractor and the city, it was alleged that the changes were made with the understanding that the plaintiff was to receive extra compensation for the extra expense of furnishing different stone from that specified in the contract, and that the plaintiff notified the city of its claim against the principal contractor before the city settled with the latter. The contractor denied the agreement for additional compensation and set up a counterclaim because it had to go into the open market at an increased price when the plaintiff's plant broke down. The jury found for the plaintiff in the full amount of its claim, deducting the defendant's counterclaim. On appeal, judgment for the plaintiff was affirmed, the change in the contract being competent though it varied a written contract, as it was made subsequent to the original contract. And, the company having accepted the stone, it was held chargeable for its value even if there was no express promise. *J. E. Lane & Co. vs. Central Engineering Co.*, North Carolina Supreme Court, 111 S. E. 344.

SECURITY FOR LABOR AND MATERIALS FOR MUNICIPAL PUBLIC WORKS

Massachusetts St. 1920, c. 210, requires that, in order to obtain the benefit of security held by a city, town or county to pay for labor performed or material and labor supplied in the repair or construction of a public building or public works, a sworn statement of the claim shall be filed in the town clerk's office within sixty days after the plaintiff ceases to perform labor or ceases to supply labor and material. The Massachusetts Supreme Judicial Court holds, *Brockway-Smith Corporation vs. Robert A. Boyle Co.*, 135 N. E. 136, that in order to avail oneself of the remedy given by the statute, it must be strictly complied with. To establish a lien upon security held by a town, the petitioner must show that he had complied with the statutory provisions, and filed with the town clerk within sixty days after he ceased work sworn statement of his claim. And although a contract with a town for the construction of a building was executed before the taking effect of the 1920 act, a contractor who ceased to furnish labor and material in July, 1920, when the statute was in force, was bound to comply with the statute in order to have the benefit of the security.

NEWS OF THE SOCIETIES

CALENDAR

June 26-30—AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Annual convention. Niagara Falls, Ont.

June 26-July 1—AMERICAN SOCIETY FOR TESTING MATERIALS. 25th annual meeting. Chalfonte-Haddon Hall Hotel, Atlantic City, N. J.

July 12-14—NEW ENGLAND ASSOCIATION OF COMMERCIAL ENGINEERS. Exhibition. Auditorium Bldg., Springfield, Mass.

Aug. 15-18—INTERNATIONAL ASSOCIATION OF FIRE ENGINEERS. Fiftieth convention. Municipal Auditorium, San Francisco, Cal. Secretary, James J. Mulcahey, Chief, Yonkers, N. Y., Fire Dept.

Aug. 23-Sept. 2—NATIONAL SAFETY CONGRESS. Detroit, Mich.

Sept. 11-15—ASSOCIATION OF IRON AND STEEL ELECTRICAL ENGINEERS. New Auditorium, Cleveland, Ohio.

Sept. 12-15—NEW ENGLAND WATER WORKS ASSOCIATION. 41st annual convention. New Bedford, Mass. Secretary, Frank J. Gifford, Tremont Temple, Boston, Mass.

Sept. 25-28—SOUTHWEST WATER WORKS ASSOCIATION. Annual convention. Hot Springs, Ark.

Oct. 1-6—AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS. Annual convention. Cleveland, Ohio.

Oct. 16-19—AMERICAN PUBLIC HEALTH ASSOCIATION. Annual meeting. Cleveland, Ohio.

Nov. 15-16—NATIONAL INDUSTRIAL LEAGUE. Annual meeting. New York City. Secretary, J. H. Beck, Chicago.

Dec. 7-13—NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING. New York City.

AMERICAN ASSOCIATION OF ENGINEERS

The Eighth Annual Convention of the American Association of Engineers met in Salt Lake City, Utah, on June 5, 6, and 7. Discussion was centered on policies for the ensuing year, problems affecting engineers, and methods of perfecting the usefulness of the Association and the profession to the public. Three days were devoted to discussion of these broad problems and action was taken as follows:

The reclamation of arid and swamp lands was endorsed and also the Smith-McNary Bill now pending before Congress.

The appointment of an engineer executive on the U. S. Civil Service Commission was urged and A. B. McDaniel recommended for appointment.

Prompt action by Congress on the bill to aid federal employes (H. R. 8928) was recommended.

An official statement of the policies of the Association to railroad executives was authorized to acquaint them "with the real objects of the A. A. E., the betterment of the conditions of the engineer, the education of the public as to the dignity and importance to civilization of the profession of engineering, and that the best interests of the profession, as such, call for loyalty to, co-operation with, and devotion to the interests of the client or employer, whether corporate or individual."

Action by Congress to relieve the labor shortage in Hawaii was urged and support of Joint Resolution 171 H. R. recommended.

In developing policies and methods for making the Association and the profession of greatest usefulness in the life of the average American:

Service to special classes of engineers was recognized and urged by the Association as a whole rather than by action as classes.

Close co-operation with business clubs was urged and provided.

Provision was made for support of work of local units by granting them 40 or 60 per cent. of the annual dues, depending on the amount of work undertaken by the local units.

Provision was made for the development of a comprehensive employment service under the supervision of the Board of Directors.

There was considerable rivalry as to where the next convention should be held, and it was recommended that the following cities receive consideration for coming conventions: 1923—Norfolk, Va.; Atlanta, Ga.; Louisville, Ky.; Columbus, O.; 1924—San Francisco, Calif.; 1925—Portland, Oregon; 1926—Philadelphia, Pa.

H. W. Clausen, Treasurer, reported that the total income of the Association from all sources for the period from May 1, 1921 to April 30, 1922 was \$218,176.84; of this amount \$113,067.98 was returned to the chapters for local work.

Standing committee reports were read as follows: "Qualifications"; "Practice"; "Administrative Board of Professional Engineer"; "Chapter Activities"; "Political Activities"; "Railroad Committee"; "Classification of Engineering Schools"; "Education"; "Services and Fees"; "Legislation"; "Employment," K. H. Talbot. Mr. Talbot referred briefly to the work accomplished in assisting members to find suitable employment, particularly during the period of depression. He stated that 7,340 applications for employment were received in 1921 and 2,751 men were placed. On an average, the members changed their addresses once in two years.

The discussion of methods to be used in local work were led as follows with A. B. McDaniel as chairman: "Principles of Chapter Success," G. R. Fansett; "A Standard Chapter Constitution," delegates of Maryland and Delaware; "How to Rate Your Chapter," W. G. Ruegnitz; "Local Civic Responsibility," W. H. Scales; "Chapter Bulletins and News Service," A. J. Capron; "How To Do Chapter Work,"

H. H. Allen; "Obtaining and Holding Members," Will P. Blair; "Publicity and Public Affairs," W. W. DeBerard; "Conducting Chapter Meetings," E. T. D. Myers; "How to Make Officers Function," T. A. Dungan; "How to Arouse and Sustain Membership Interest," A. M. Knowles; "How to Assist National Headquarters in Collecting Dues," T. A. Dungan; and "The Sphere of Women in Chapter Activities," B. W. Matteson.

The Ogden Chapter was awarded a banner for excellence in public information work during the past year. The convention was addressed by J. D. Broadus, who delivered an illustrated lecture on scenic Utah; H. J. Grant, President of the Latter Day Saints' Church, spoke at the banquet; and Virgil E. Rorer, D.D., pastor of the Meridian Street Methodist Episcopal Church of Indianapolis, spoke on Americanism, calling attention to the importance of Americanization work.

The convention delegates were royally entertained by the Salt Lake City Chapter of the Association with C. J. Ullrich as chairman of the Entertainment Committee. There was a dance, a smoker, a banquet, an organ recital at the Latter Day Saints' Tabernacle, a plunge in Salt Lake followed by a supper, and many automobile trips to points of interest, including the enormous workings of the Utah Copper Company.

The officers elected were: President, A. N. Johnson, Dean of Engineering, University of Maryland, College Park, Maryland; First Vice-President, Geo. E. Taylor; Second Vice-President, A. M. Knowles; Directors, W. S. Boyle, Wythe M. Peyton, C. A. Poole, F. C. Shepherd, H. C. Ferry.

THE NEW ENGLAND WATER WORKS ASSOCIATION

The June Outing, to Providence, R. I., and vicinity, June 27, will be a personally conducted 45-mile automobile tour of Rhode Island, including a Shore Dinner at Rocky Point, on Narragansett Bay, and a visit to Scituate Dam, under construction for the past year and now at an interesting stage.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS

The thirty-eighth annual convention of the American Institute of Electrical Engineers will be held in Niagara Falls, Ont., on June 26-30, 1922, with the Clifton Hotel as headquarters. The technical program is made up of five main groups of papers and in addition several papers on a variety of subjects, ranging from pure physics to practical mechanical engineering. These groups, briefly stated, are: The New Queens-town Plant; Standards of Rating of Generator Insulation; The Baltimore Oil Circuit Breaker Tests; Symposium

(Continued on page 470)

New Appliances

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations

HUG TRUCK TURNTABLE

This equipment, manufactured by the Hug Company, was designed for contractors' use in accordance with a realization of their needs gained by several years' experience in road building. It turns a loaded truck on the truck's own power; protects the subgrade; requires no tracks; occupies only $7\frac{1}{2}$ foot width on road; can be moved by two men; speeds up the job; requires fewer trucks; eliminates delays; provides more yardage.

For operating the turntable, drive on it in low gear and bring truck to stop when right hand wheel strikes the bumper on turntable. Start up truck on low gear, engaging clutch slowly.

By turning and locking wheels turntable can be easily moved ahead to new position by two men. The turntable being light, can thus be kept close to the work, thereby reducing the distance trucks must be backed to deposit load.

Carried in stock in two sizes, for Ford ton trucks, weight 600 pounds, \$330; for $2\frac{1}{2}$ -ton trucks, 112 to 120-inch wheel base, weight 700 pounds, \$440; special sizes built to order.

With the Buda "Buddie" power plant and Werner gear transmission with a gear ratio of 4.84 to 1 on low, and a Clark bevel gear axle with a gear ratio of 5-1/2 to 1 on high, the Hug is believed to meet all conditions encountered on a road job. It speeds up on good roads and pulls and digs itself out through soft and spongy spots due to the low gear ratio in the transmission.

The special dump body will hold a six-bag batch of mixed concrete.

An analysis of actual performance of hauling mixed concrete one mile from machine to slab shows that the Hug machine averaged 56 trips in 10 hours while a one-ton truck averaged only 40 trips in 10 hours, showing an increase of efficiency of 35 per cent. in speed for the Hug truck and 50 per cent. in capacity over the one-ton truck.

The truck has a capacity of 4,000 pounds, chassis weight of 3,400 pounds, wheel base of 120 inches, and a road speed of 45 miles per hour. The Hug truck used with a 6-sack mixer on an

The longer the haul, the greater the saving. Records of service of Hug trucks show hauling mixed concrete at an average speed of 20 miles per hour, hauling bricks 17 miles over dirt road in 50 minutes, and 20 miles in 45 minutes over concrete roads. In doing the work, the truck was run about 10,000 miles without repairs.

JEFFREY RADIAL TYPE LOADERS

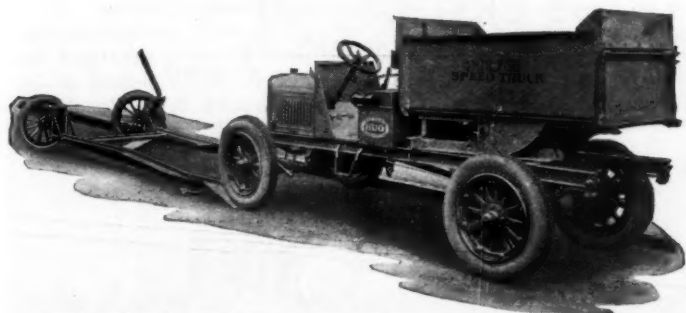
The Jeffrey Radial Loaders, made by the Jeffrey Manufacturing Co., have been developed by over ten years' experience in designing and building self-propelling loaders for the handling of sand, gravel, crushed stone, coal and other loose materials from ground storage, and have eliminated the former inability of this class of machine to feed into the stock or storage pile.

In this machine the elevator is mounted upon a three-wheel chassis, and buckets are wider than the elastic boom, which features allow the machines to advance 8 to 10 feet into the stock pile without any cleaning up.

The three-wheel radial loader is more convenient than the four-wheel type and



THE HUG TURNTABLE, USED ON SUBGRADE, AND TURNING LOADED TRUCKS BY THEIR OWN POWER.



HUG SPEED TRUCK MOUNTING HUG TURNTABLE.

HUG SPECIAL SPEED TRUCK

This truck, manufactured by the Hug Company, was built after several years of road building experience by C. J. Hug, who realizing the need of a truck especially adapted for this service, designed and constructed an experimental truck for use on his own road contracts. Its remarkable performance under actual working conditions, its economy of time and money, and its practical service led to its commercial production.

8-day test averaged 960 linear feet of concrete pavement at a labor cost of \$913.92 for one mile which was completed in 5.44 days in comparison with a labor cost of \$1,386.00 per mile completed in 8.25 days with 10 4-ton trucks and a 4-sack mixer. This showed a saving of \$472.00 on payroll cost, \$110.00 on gasoline cost, \$220.00 on truck rental, \$25.00 on plant equipment and \$25.00 on overhead expenses, making a total of \$852.00 or 8 cents per square yard of pavement made.



JEFFREY RADIAL TYPE LOADER, SHOWING THE SMALL RADIUS IN WHICH IT WILL OPERATE.

will turn in a smaller circle around either drive wheel as a center. It will turn short corners and can be propelled in any direction as readily as a wheelbarrow. Elevator buckets are provided with renewable digger edge steel teeth.

A large dribble chute catches all the spill and returns it to foot of elevator. The long flexible spout enables the operator to properly distribute the truck load without hand trimming. The elevator boom is quickly adjustable without loosening a bolt. The collapsible fea-

ture makes it possible to ship the machine completely assembled.

Both elevator and self-propelling mechanism are through friction clutches which may be operated simultaneously or independently of each other. The driving wheels are fitted with roughing cleats. The machine is equipped with either an electric motor or a gasoline engine.

All controlling levers are handy and easily moved from a single operator's position. The machine is operated by one man and does not require skilled labor. The boom can be readily adjusted to clear ground or any obstruction. The radial loader saves the labor of 5 to 10 men and handles more material in the same time besides cutting down the waiting time of trucks.

The type "K" loader has a rated capacity of 1 cubic yard per minute; will load a 5-ton truck in 8 to 10 minutes; will handle 2½-inch crushed stone and coal up to 6 inches. The propelling speed of 60 feet per minute for traveling from pile to pile and digging speed of 4 feet per minute, are independent of the elevator. The shipping weight is 5,500 pounds with motor and 6,000 pounds with engine.

The type "G" loader is designed for heavy service. Its capacity is 1½ to 2 cubic yards per minute of sand, gravel, crushed stone, coal, cinders and similar loose materials, and it is high enough to load any type of truck. It has a fast speed of 40 feet per minute for traveling from pile to pile and a slow speed of 2 feet per minute for feeding into the material. The shipping weight is approximately 8,500 pounds.

THE DUNN ROAD BUILDER

The Dunn Mile-a-Week Road Builder, manufactured by The Dunn Road Machinery Company, replaces the hand tamper and float, and although it came into general notice for the first time at the Road Show at Chicago, last January, it was invented some years ago. It was first used for tamping and laying base courses for monolithic brick roads. This

method of laying brick roads and pavements was developed by the Dunn Wire-Cut Lug Brick Company, and has come into widespread use.

Mr. Dunn and other officers of this company organized the Dunn Road Machinery Company, bought the patents and took up the manufacture of this machine. Notwithstanding that several machines had already been built and put into use and are still rendering good service, thus showing that its operating principles were fundamentally sound, engineering talent was secured and the machine was redesigned for operation on all kinds of road work. Every change was carefully tested out in actual concrete road work by experienced highway engineers and contractors to insure a machine which fills every requirement for first class service which is constructed entirely of metal, almost eliminating upkeep.

It will tamp and finish concrete roads, either of the regular type or two-course concrete pavements, and it will finish base courses for other types of surface. It has adjustments at all required points to make it universally adaptable to roads with various crowns and for handling all kinds of mixtures and aggregates. All the tamping members have a positive stroke and can all be adjusted to penetrate the concrete to a predetermined depth.

The concrete in addition to being struck off and leveled in two stages by the auxiliary strike-off and the main strike-off is also operated upon by three separate tamping members; first, by the clearing tamper, which running at a comparatively slow speed, drives the larger pieces of gravel or crushed stone down a slight amount below the finished surface; second, by the spader, which is a ¾-inch blade running at about 130 strokes per minute, and is so timed in relation to the forward motion of the machine that each blow on the concrete laps the area covered by the previous blow by about half the thickness of the blade, or in other words it actually strikes all portions of the surface twice. The third

working operation is done by the tamper, which is a 4-inch channel with the flanges turned up, and is so set that the extremity of its stroke is even with the form and which practically finishes the road. It actually does so, on base course work, but when working on finished concrete the slight variations in the mortar are smoothed out by the finishing belt, which is automatically moved back and forth across the road, with a five-inch stroke.

All the tamping or working operations are such as to secure great density of the concrete without any repetition of the work to cause a separation of the coarse and fine material, or of raising an undue amount of mortar to the surface. The machine travels over the work only once, consequently there is no possibility of breaking the bond on partly set concrete.

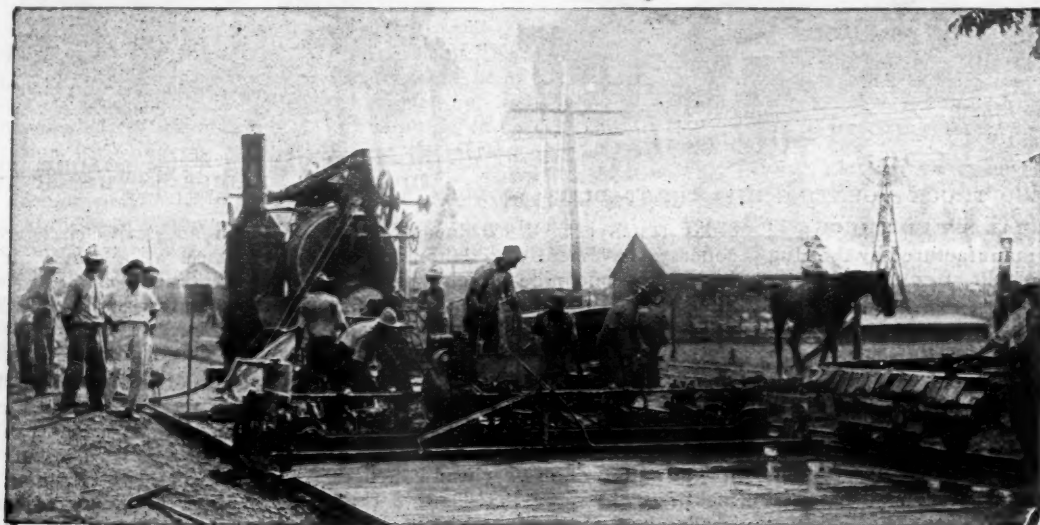
The method of propulsion is altogether different from that of any other machine. There are two drums mounted on the forward end of the machine and driven by means of miter and worm gearing. On each drum there is wound a steel cable, the loose ends of which are attached to angle iron stakes driven into the ground on both sides of the road from 100 to 200 feet ahead of the machine. The drums are independently driven by clutches under the operators' control, and on account of the large speed reduction at the drums, exert a tremendous pull. This means that the condition of the rail or road form surface on which the machine runs is of no consequence as far as propulsion of the machine is concerned. There are, however, scrapers mounted in front and in the rear of each of the four wheels to insure a perfectly smooth finish on the road surface.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS

(Continued from page 463)

on Engineering Education; Papers on Miscellaneous Subjects and Insulation and Rating of Electric Cables.

Entertainments and convention trips have also been liberally arranged for and will take in many points of interest which abound in the locality.



THE DUNN MILE-A-WEEK ROAD BUILDER FINISHING CONCRETE PAVEMENT.

RUBER-OLD

PIPE-SEAL Will Prevent This

It cost approximately \$2,350 to clean roots from three miles of sewer in Schenectady, New York, last year and Schenectady has 150 miles of sewer!

The employ of Ruberoid Pipe-seal in the original construction would have saved all this because Ruberoid Pipe-seal is a joint compound that prevents the penetration of roots. Besides saving this money, the ordinance passed several years ago requiring the removal of all poplar trees in the vicinity of a sewer would not have been necessary.

Ruberoid Pipe-seal, besides being thoroughly effective in preventing root penetration, is proof also against infiltration, resist the action of sewage acids, and makes a tight, flexible joint that allows for any subsequent settling of the pipe.

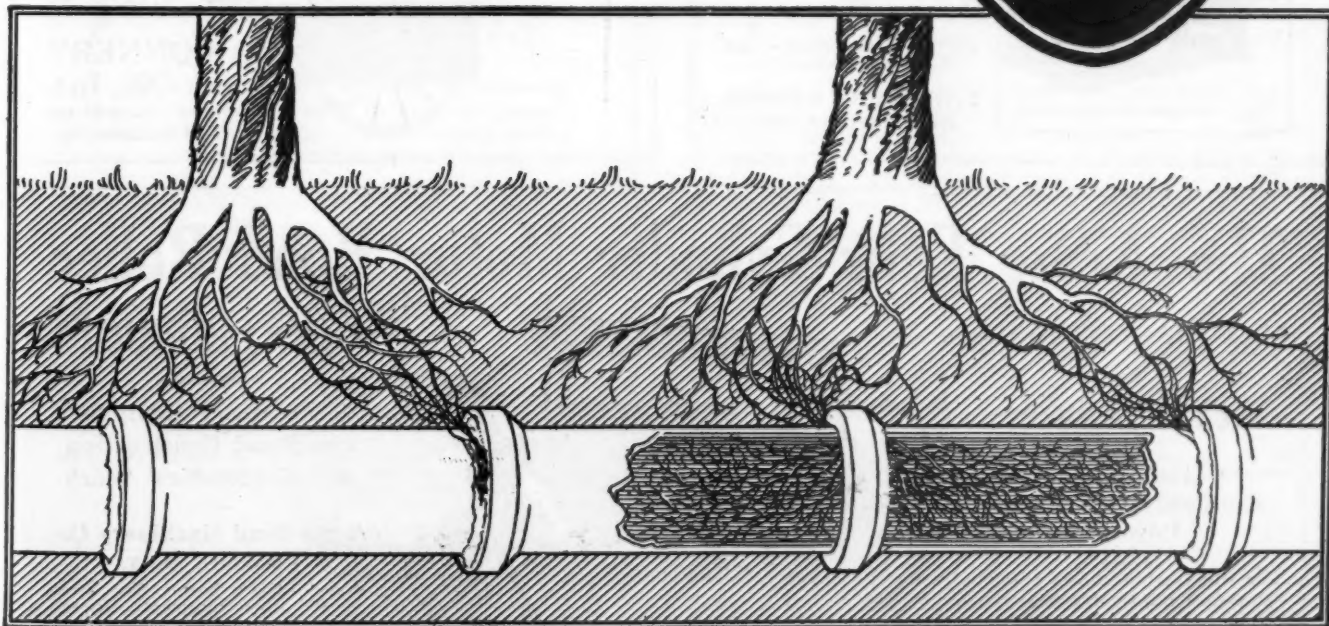
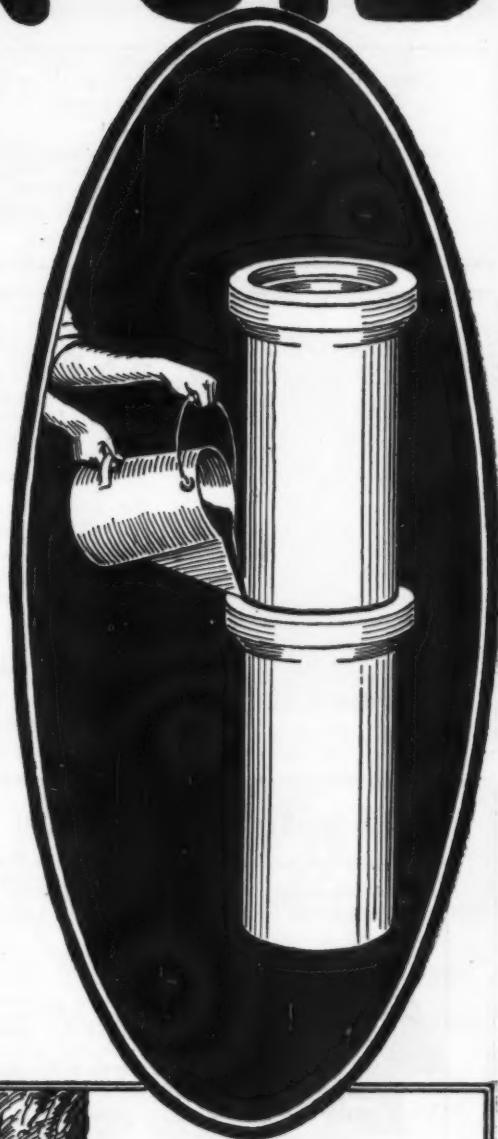
Send for our Ruberoid Pipe-seal folder which, besides a description of the properties of the compound, contains instructions for its application.

The RUBEROID Co.

95 Madison Avenue, New York

Chicago

Boston



COLD PATCH

Maintenance Our Specialty
HEADLEY GOOD ROADS CO.

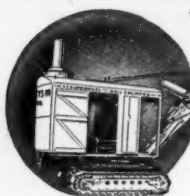
Franklin Trust Building
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ASPHALT AND ROAD OIL

The Wyckoff Pipe & Creosoting Co., Inc. GENERAL CREOSOTERS Established 1881

Creosoted Wood Block, Conduit, Cross-Arms, Anchor Blocks, Poles, Cross-Ties, Piling, Wharf Timbers, Bridge Timbers, Lumber, etc. Water Pipe, Steam Pipe Casings, Liquor Log.

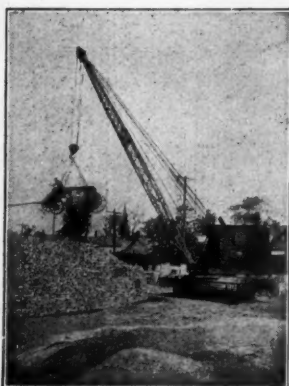
Main Office: 17 East 42nd St., New York City, N. Y.
Factory: Portsmouth, Virginia



ERIE Steam Shovels

For road grading; handling road materials with clamshell bucket; cellar and trench excavation; excavating sand and gravel, rock, etc. We will be glad to send photos and data, showing just what the ERIE Shovel is doing on these classes of work.

Write for Bulletin "H"
ERIE STEAM SHOVEL CO., Erie, Pa., U.S.A.
Incorporated 1883. Formerly BALL ENGINE CO.



SAVE TIME AND LABOR

By Purchasing the
Dependable

O. S. Locomotive Crane

for handling your material. We equip them with various automatic devices for the economical handling of material.

Write for details.

Orton & Steinbrenner Co.

Chicago, Illinois
Factory: Huntington, Ind.

LOWEST HOTEL RATES IN NEW YORK ACCOMMODATIONS BETTER THAN RATES INDICATE

BROADWAY CENTRAL HOTEL



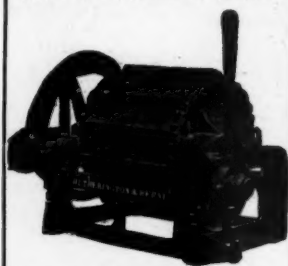
Midway Between
Battery and Central
Park, Broadway at
3rd Street, New York
City; Heart of Wholesale
District; Capacity,
1,000 Guests.

Rates:
250 Cheerful Rooms, Free
Use of Tub or Shower
Bath\$1.00
100 Cheerful Rooms, Free
Use of Tub or Shower
Bath\$1.50
150 Cheerful Rooms, Private
Bath\$2.00 up
Two and Three Room
Suites in Proportion

JAY G. WILBRAHAM, President

The H & B PAVING BRICK TESTING MACHINE

N. P. B. M. Standard Rattler



For Testing of Paving Brick

As we now build this machine it embodies all of the

Latest Improvements

and refinements of construction that have been found desirable during a period of try-out covering almost one year of time and conducted under the direction of the technical committee of the National Paving Brick Manufacturers' Association.

For descriptive circular and prices address

HETHERINGTON & BERNER
INDIANAPOLIS, IND.

CONNERY'S TAR AND ASPHALT HEATING KETTLES

NON-LEAKABLE—(Double Electric Welded)—

"HELD BY THE WELD"

These heaters and kettles are strong, durable and practical, and can be obtained in all sizes and styles.

Immediate Shipment

Write at once
for complete
catalog and
prices.



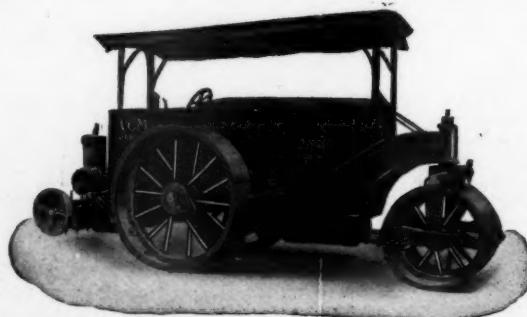
**CONNERY
& CO., Inc.**
3900 Second Street
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The Acme Four-Cylinder Motor Road Roller

One More Triumph
for
Acme Engineers

A Machine that is
Constant—Dependable
Powerful

The illustration shows the Air
Pressure Controlled Scarifier



ACME PRODUCTS

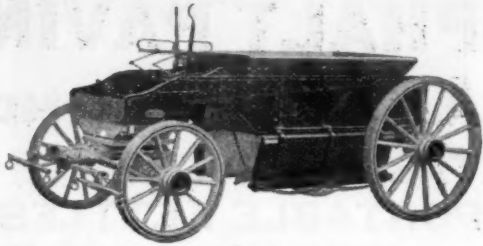
Include

All Necessary Equipment
For Road Construction
and Contractors' Work

Acme Road Machinery Co.

Frankfort, N. Y.

Branch offices: Boston, New York,
Baltimore, Cincinnati, Chicago



An
**Automatic Dump Wagon Specially
Designed for Contractors**

In our Susquehanna model we offer an exceptionally sturdy and well designed wagon of from 1½ to 3 yards capacity.

In closing the bottom doors, one side always shuts first, making a dirt-tight joint.

Its light draft, large wheels and short turning radius, make it unusually desirable for road work.

Send for descriptive literature and prices

The Columbia Wagon and Body Co.
Columbia, Pa.

We build the Jennings Automatic Dump Body for Ford Ton and other makes of Ton Trucks. Send for circulars.

STANDARD

Asphalt Products

Standard Asphalt Binder A for surface treatment.

Standard Asphalt Binder B for penetration work.

Standard Asphalt Binder C for the mixing method.

Standard Refined Mexican Asphalt for sheet asphalt paving.

Standard Asphalt Joint Fillers for brick or block pavements

Standard Paving Flux, Standard Bridge Asphalt and Preserving Oils.

STANDARD OIL CO. OF NEW YORK
26 Broadway

Specifications and all other particulars furnished on request.



—DETROIT—

**Reversible and non-reversible
Four wheel trailers**

**All kinds of Semi-trailers
Heavy duty special trailers**

We handle the
Mansfield Steel Corporation
GRAVITY DUMP BODIES
POWER AND HAND HOIST BODIES
RADIATOR GUARDS

DETROIT TRAILER COMPANY

954 Milwaukee Avenue East
Detroit, Michigan

A Trailer For Every Purpose



means "Tilting Drum"
—and that Means Mixing Efficiency

THE Jaeger tilting drum empties a batch as quickly and easily as emptying a bucket of water. It completes a batch in about half the time of any non-tilting drum mixer. *That spells profit.*

Its low initial cost, simplicity, and unusually low upkeep, make this sturdy mixer the choice of 12,000 contractor users. The costs for road and street making and maintenance have been cut to a minimum in New York, Ohio and other states that use this mixer almost exclusively for this work.

For every city job there's a Jaeger that will just fit your needs. The coupon brings full facts on the complete Jaeger line of 18 mixer outfits and our new low price list. Write today.

The Jaeger Machine Co., 400 Dublin Ave.
Columbus, Ohio

No. 4-L



The Jaeger Machine Co.,
400 Dublin Ave., Columbus, O.

Gentlemen:

Please send me your new low price list and catalogue on Jaeger mixers.

Name

Address



ASPHALT PAVING PLANTS ALL KINDS

PORTABLE DRYERS

PORTABLE KETTLES

FIRE WAGONS, ETC.

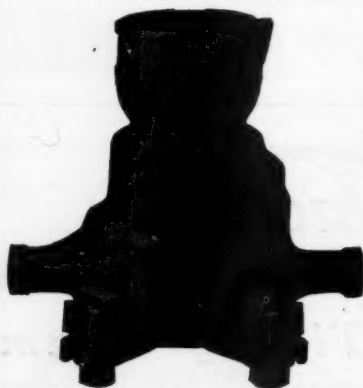
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KEYSTONE TYPE "W"
ARCTIC FROST BOTTOM
EUREKA
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If it is a
WATER METER
service these
meters will
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GENERAL OFFICE AND WORKS

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Los Angeles—Union Bank Bldg.



MAIN ST.

Signs of
DISTINCTION

Good street and traffic signs are as important as good streets and efficient lighting. You don't want lights that will not illuminate properly at night, neither do you want signs that will not guide right during the day.

"ING-RICH"
PORCELAIN ENAMELED IRON
SIGNS

never rust, fade or discolor. They are made of mineral porcelain and iron united by special process, into one substance extremely durable. The worst weather you ever saw will not affect them. They are guaranteed for ten years.

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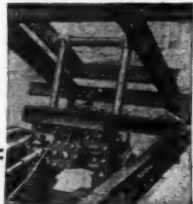
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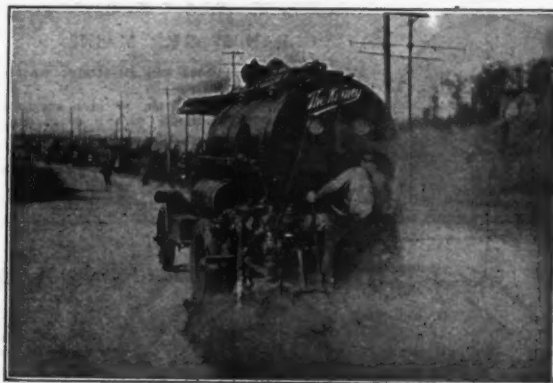
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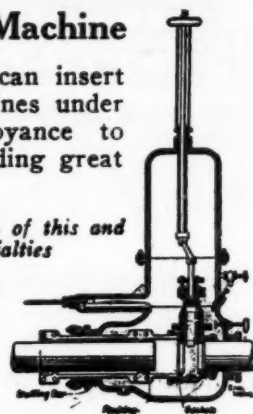
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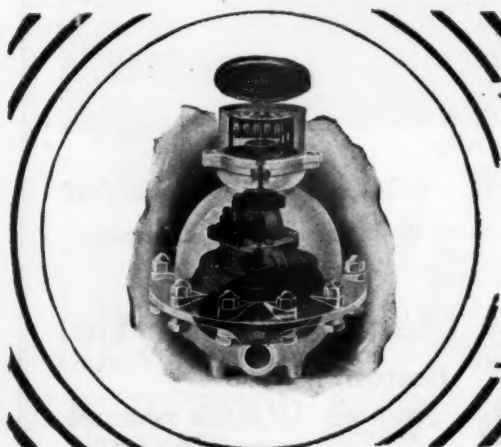
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Advance Contract News

ADVANCE INFORMATION

ITEMIZED PRICES

To be of value this matter must be printed in the number immediately following its receipt, which makes it impossible for us to verify it all. Our sources of information are believed to be reliable, but we cannot guarantee the correctness of all items. Parties in charge of proposed work are requested to send us information concerning it as early as possible; also correction of any errors discovered.

BIDS ASKED FOR

STREETS AND ROADS

- Conn., Norwalk** 2 p.m., June 24
For pav. 3,150 sq. yds. cem. conc. rd.—C. L. Barton, Mayor.
- Conn., New Haven** 10 a.m., June 27
For pav. sts.—Edw. S. Nettleton, City Engr.
- D. C., Washington** June 26
For asph. surf. sts.—Dist. Comrs., Dist. Bldg.
- Fla., Clearwater** 8 p.m., June 28
For pav. with brk. and asph. blk., drain. and grad. various sts.—J. R. Thomas, City Clk.
- Fla., Quincy** 4 p.m., July 18
For pav. with curb., gutters and const. sewers, etc.—City Council.
- Fla., Tallahassee** June 27
For surf. 17.87 mi. on 2 rds.—St. Hwy. Dept.
- Ind., Angola** 2 p.m., July 3
For impv. H. L. Smith Rd., \$96,619—Frank O. Watkins, Co. Aud.
- Ind., Cannelton** 1 p.m., July 3
For impv. Dan Gayer et al rock rd., \$34,944, and Jacob Hausen et al rock rd., \$20,056—T. A. Lasher, Co. Aud.
- Ind., Crawfordsville** 10 a.m., July 5
For impv. 5,466 ft. Wm. Kirkpatrick et al rd., \$4,931—Ward McClelland, Co. Aud.
- Ind., English** 2 p.m., July 6
For const. Amos Mocheler et al, Louis J. Gast, A. L. Pierce and Wm. F. Sommers et al rds.—B. H. Kinne, Co. Aud.
- Ind., Indianapolis** 10 a.m., June 28
For curb., grad., pav. and resurf. sts.—Bd. Pub. Wks.
- Ind., Monticello** 10 a.m., July 5
For M. E. Spencer Rd., 6,720 ft., \$10,512—F. E. Vinson, Co. Aud.
- Ind., Paoli** 2 p.m., July 5
For const. Part Orleans and Liberty Rds., French Lick and Norton Rd., 12,174 and 3,981 ft. respv.—P. M. Stephenson, Co. Aud.
- Ind., Shelbyville** 10 a.m., July 5
For impv. 5,330 ft. Warren Buck, 9,446 ft. Melvin Havens and 5,625 ft. Jacob Schuck rds., gravel—Walter W. Leslie, Co. Aud.
- Ind., Indianapolis** June 30
For pav. 2.55 mi. rd., conc., \$86,252.—Co. Comrs.
- Ind., Bedford** 1 p.m., July 10
For const. gravel, or mac. rd. on Co. line bet. Lawrence and Orange Cos.—Wm. M. Denniston, Co. Aud.
- Ind., Fort Wayne** 10 a.m., July 11
For impv. 3 mi. Eby Rd., \$76,800—Angus C. McCoy, Co. Aud.
- Ind., Indianapolis** 10 a.m., July 5
For const. 3,533 mi. F. A. 32, Sec. A-C—J. D. Williams, Dir., St. Hwy. Com.
- Ind., Kentland** 1 p.m., July 3
For impv. 3 mi. Shaw Rd., gravel—John G. Davis, Co. Aud.
- Ind., Shoals** 2 p.m., July 3
For const. 3 county unit rds., 7,439, 19,008, 18,383 and 17,765 ft. long—Bertie L. Newland, Co. Aud.
- Ind., Indianapolis** 2 p.m., June 26
For grad. and pav., also resurf. rdways—Bd. Pub. Wks.
- Ind., Versailles** 1 p.m., July 3
For const. Geo. Sparling et al free conc. rd., 10,736 ft.—W. D. Robinson, Co. Aud.
- Ind., Madison** 1 p.m., July 5
For impv. Frank D. Spann et al rd., 15,680 ft., Edwin C. Reed et al rd., 13,200 ft., John H. Gray et al rd., 2,700 ft., Geo. F. Stiver et al rd., 10,740 ft., and John B. Corya et al rd., 15,485 ft.—Chas. S. Dibler, Co. Aud.
- La., Atlantic** 1:30 p.m., June 26
For const. prim. rd., F. A. Proj. No. 155—Co. Aud.
- La., Dakota City** 1:30 p.m., June 30
For grav. surf. F. A. Proj. No. 117—Co. Aud.
- La., Onawa** 3:30 p.m., June 26
For grad. 2½ mi. prim. rd., Proj. No. 38, Sect. D—Co. Aud.
- La., Pochontas** 1:30 p.m., June 27
For grad. and incidental work on Sect. Z, Pochontas-Gilmore Rd.—Co. Aud.
- La., Washington** 1 p.m., June 26
For grad. and drain. 16.35 mi. prim. rd., F. A. Proj. No. 167—Co. Aud.
- Kans., Osawatimie** 2 p.m., June 30
For pav. grad., and guttering drive-ways in park—Bd. Trustees, John Brown, Memorial Park.
- Kans., Troy** July 7
For grad. bridging and pav. 7.844 mi. F. A. Projs. 116 and 87.—H. L. Parker, Engr.
- Ky., Paris** July 5
For pav. Main St.—J. W. Hayden, City Clk.
- Ma., Forsyth** 2 p.m., June 27
For impv. 2.434 mi. Proj. 20.150—C. W. Brown, Act. Ch. Engr., St. Hwy. Com.
- Mass., Boston** noon, June 27
For granite block pavt. in South Boston, and sh. asph. or bitul. pavt. in city proper—Jos. A. Rourke, Comr. Pub. Wks.
- Mass., Boston** noon, June 28
For sh. asph., bitul. and granite block pavt. in Roxbury and sh. asph. or bitul. pavt. in Charlestown—Jos. A. Rourke, Comr. Pub. Wks.
- Mass., Boston** 1 p.m., June 27
For const. 6,950 ft. bit. mac. rd. in Ayer and Shirley, 600 in Ashland and 3,400 in Action—A. W. Dean, Ch. Engr., Div. Hwys., Dept. Pub. Wks.
- Mich., Benzenville** 10:30 a.m., July 7
For impv. 3,299 mi. St. Trunk Line Pds. Nos. 12-24 and 12-29—F. F. Rogers, St. Hwy. Comr.
- Mich., Escanaba** 10:30 a.m., June 30
For impv. 1,387 mi. St. Trunk Line Rd. No. 35-9, and 13,261 mi. F. A. Rd. No. 25, Sect. A, and St. Trunk Line Rds. No. 12-2 and 12-4—F. F. Rogers, St. Hwy. Comr.
- Mich., Houghton** 11 a.m., June 29
For surf. treat. 4,056 mi. St. Trunk Line Rds. 26-3 and 26-8, Sect. B—F. F. Rogers, St. Hwy. Comr.
- Mich., Jackson** 1 p.m., July 6
For impv. .396 mi. rd. and const. sub-structure for undercrossing passing under tracks—F. F. Rogers, St. Hwy. Comr.
- Mich., Sandusky** 1 p.m., July 11
For impv. 1.241 mi. St. Trunk Line Rd. No. 27-18—F. F. Rogers, St. Hwy. Comr.
- Mich., Dearborn** 8 p.m., June 24
For const. conc. pavt. and curb on sev. sts.—Herman B. Knauff, Vil. Clk.
- Mich., Grand Rapids** 9 p.m., July 6
For impv. 2,564 mi. St. Trunk Line Rd. No. 13-16—F. F. Rogers, St. Hwy. Comr.
- Mich., Iron Mountain** 2 p.m., July 6
For impv. 4,945 mi. St. Trunk Line Rd. No. 12-36—F. F. Rogers, St. Hwy. Comr.
- Mich., L'Anse** 10:30 a.m., July 12
For impv. 9,344 mi. St. Trunk Line Rd. No. 69-4—F. F. Rogers, St. Hwy. Comr.
- Mich., Munising** 10:30 a.m., July 5
For impv. 2,034 mi. St. Trunk Line Rd. No. 25-14, Sect. A—F. F. Rogers, St. Hwy. Comr.
- Mich., White Pigeon** 1:30 p.m., June 29
For impv. 6,367 mi. F. A. Rd. No. 66, Sect. A—F. F. Rogers, St. Hwy. Comr.
- Mich., Cadillac** 1:30 p.m., June 30
For impv. 3,729 mi. St. Trunk Line Rds. Nos. 22-14 and 22-4, Sects. A and C—F. F. Rogers, St. Hwy. Comr.
- Mich., Grand Haven** 1:30 p.m., June 27
For impv. 4,560 mi. St. Trunk Line Rd. No. 16-5—F. F. Rogers, St. Hwy. Comr.
- Mich., Manistiquie** 10:30 a.m., June 27
For impv. 17,544 mi. St. Trunk Line Rds. Nos. 12-30, 12-12, 12-17 and F. A. Rd. No. 25, Sect. B—F. F. Rogers, St. Hwy. Comr.
- Mich., Jackson** 9 a.m., June 29
For impv. 2,919 mi. F. A. Rd. No. 75, Sect. B—F. F. Rogers, St. Hwy. Comr.
- Mich., Harrison** 1:30 p.m., June 28
For impv. 1,937 mi. St. Trunk Line Rd. No. 20-11, Sect. B—F. F. Rogers, St. Hwy. Comr.
- Mich., Marshall** 1:30 p.m., June 30
For impv. 2,302 mi. F. A. Rd. No. 29, Sect. B and St. Trunk Line Rd. No. 17-1—F. F. Rogers, St. Hwy. Comr.
- Mich., Sault Ste. Marie** 10:30 a.m., June 28
For impv. 9,060 mi. St. Trunk Line Rds. Nos. 48-6, Sect. A, 48-10 and 48-5, Sect. A—F. F. Rogers, St. Hwy. Comr.
- Mich., Traverse City** 1:30 p.m., June 27
For impv. 1,269 mi. St. Trunk Line Rd. No. 11-12, Sect. B—F. F. Rogers, St. Hwy. Comr.
- Minn., Barnesville** 9 p.m., June 24
For 1 mi. rd. in Atherton Twp.—C. W. Williams, Town Clk.
- Minn., Duluth** 1:30 p.m., July 10
For road work on F. A. Proj. 183, St. Jobs 2005 and 2110—W. H. Borgen, Co. Aud.
- Minn., Faribault** July 10
9 a.m., gravelling Job No. 2109; 10 a.m., grad. 4½ mi. St. Rd. No. 26; 2 p.m., grad. 2 mi. Job No. 22-06; 4 p.m., grad. 2 mi. Job No. 22-07—Frank M. Kaisersatt, Co. Aud.
- Minn., Hastings** June 26
For relay, reblidg. and partial const. of new sidewalks—N. F. Kranz, City Clk.
- Minn., Mantorville** 2 p.m., July 10
For grad. const. of Job 2204, St. Rd. 3, and const. bridge—Geo. L. Taylor, Co. Aud.
- Mo., New London** 9:30 a.m., June 20
For impv. 3,329 mi. Proj. 20.168—C. W. Brown, Act. Ch. Engr., St. Hwy. Comr.
- Mo., Poplar Bluff** 11 a.m., June 24
For impv. 8,435 mi. Proj. 58-C, 8,526 mi. Proj. 58-B and 7,366 mi. Proj. 58-A—C. W. Brown, Act. Ch. Engr., St. Hwy. Comr.
- Mo., St. Louis** noon, July 11
For impv. cert. sts. by pav. curb., etc.—E. R. Kinsey, Pres., Bd. Pub. Serv.
- Neb., Lincoln** 10 a.m., June 24
For const. pav. and repav.—Theo. H. Berg, City Clk.
- N. H., Concord** 2 p.m., June 30
For 0.8 mi. bit. mac. rd. on stone base in Sunapee, incl. 2 24-ft. span rein. conc. bridges—F. E. Everett, St. Hwy. Comr.
- N. J., Glen Ridge** 8 p.m., June 26
For excav. 4,000 cu. yds. earth for rdway—John A. Brown, Boro Clk.
- N. J., Newark** 10:15 a.m., June 28
For resurf. const. conc. curb and gutter, reblidg. storm sewer—Geo. C. Bergen, Co. Purch. Agt.
- N. J., Newark** 10:15 a.m., June 26
For repav. on sides of tracks—Thos. L. Raymond, Dir., Dept. Sta. & Pub. Impvs.
- N. J., South Orange** 8 p.m., June 30
For impv. cert. sts. by curb., sidewalk, pavt., sewers, etc.—Geo. H. Becker, Chn. Bd. Vil. Trustees.
- N. J., Long Branch** 8 p.m., June 27
For pav. 18,000 sq. yds. asph. on conc. found. with conc. gutters, etc.—Frank C. Quinn, City Clk.
- N. J., Ridgefield Park** 5 p.m., July 5
For conc. rd. const.—M. D. Starker, Vil. Clk.
- N. J., Toms River** 11 a.m., July 7
For const. Route 4, Sects. 17 and 18 on st. hwy.—Bd. Chosen Freeholders.
- N. J., West Orange** 8:15 p.m., June 28
For lay. conc. curbs and pav. with bitum. pavt.—Henry C. Warnick, Town Engr.
- N. Y., Buffalo** 11 a.m., June 26
For elimination of grade crossings, incl. const. rd. bed and all track work—Grade Crossing Com., 436 Ellicott Sq.
- N. Y., Housatonic** 7 p.m., June 27
For st. impv., incl. 1½ mi. bit. mac. and 1,150 ft. curb.—A. G. Carriere, Vil. Clk.

N. Y., Fredonia June 26
For pav. cert. sts., \$40,000.—Bd. Trustees.

N. Y., Massena 8 p.m., June 26
For st. pav. on cert. sts.—W. E. Timmerman, Vil. Engr.

N. Y., Victor 8 p.m., June 24
For impv. st., 8,000 sq. yds. brick pavt. on conc. base, curb., etc.—Bd. Trustees.

O., Cleveland noon, June 28
For grad., drain., curb., pav. and impv. sev. sts.—Comr. Purchases & Supplies.

O., Columbus noon, June 27
For grad., drain., curb., pav., etc. on various sts.—W. H. Duffy, Dir. Pub. Serv.

O., Batavia July 3
For surf. treat. Cincinnati and Batavia Rd., and for Winchester Rd.—H. C. Reed, Co. Aud.

O., Columbus 1 p.m., June 30
For grad. rdway., const. bridges and culvts. on Ohio River Rd. and for impv. Dixie Hwy., Lima-Wapakoneta Rd., Sidney-Wapakoneta Rd.—L. C. Herrick, Dir. Hwys. & Pub. Wks.

O., Dayton June 26
For pav. no. of sts. and grad. and gravelling—City Engr. Houk.

O., Findlay 10 a.m., July 1
For const. Deeds Rd. and Collingwood Rd.—Martha Brown, Clk., Co. Comrs.

O., Hamilton 10 a.m., June 27
For const. two 1-mi. sects. of Center State Line Rd., also oiling Trenton and Jackson Rds.—C. Z. Mikesell, Sec'y, Bd. Co. Comrs.

O., Marion June 28
For grad., curb., drain. and const. gutters and catch basins and pav. 8 sts. of city—Chas. Drake, Clk., Bd. Pub. Serv.

O., Sidney July 3
For grad. and gravelling Rd. No. 89 in McLane Twp.—W. A. Harmon, Clk., Bd. Comrs.

O., Genoa noon, June 29
For pav. West St., incl. grad., sewers, curb, etc.—Earl Camper, Vil. Clk.

O., Bellaire June 29
For impv. and const. Flushing Uniontown Rd.—Co. Aud.

Ont., Toronto noon, July 7
For const. pavt., mac. rdway., grad. and mac. base, and const. abutments and bridge floors—W. A. McLean, Deputy Minister Hwys.

Pa., Edgewood 4 p.m., July 10
For grad. and pav. 2 alleys—W. H. Garrett, Boro Sec'y.

Pa., Etna 5 p.m., June 26
For grad., curb. and pav. and const. san. sewer, also repav., recurb., etc.—J. C. Armstrong, Boro Clk.

Pa., Indiana 7 p.m., June 30
For 28,000 sq. yds. pav., san. sewers, etc.—Thos. Pealer, Boro Engr.

Quebec June 27
For 7 mi. oiled W. B. mac. rd. in St. Therese.—J. L. Perron, Deputy Minister, Dept. Rds., Parliament Bldgs.

Tex., Port Arthur July 12
For pav. no. of sts.—City Engr. M. C. Erwin.

Tex., San Angelo 10 a.m., June 30
For impv. St. Hwy. No. 4—J. T. Mathison, Co. Judge.

Tex., Waco 10 a.m., June 28
For impv. cert. lateral rds. in Rd. Dist. No. 3—W. T. Lockwood, Co. Aud.

Tex., Wichita Falls 10 a.m., June 26
For grad., culvts. and gravel surf. 7 mi. Iowa Park-Jonesdale Rd.—Co. Aud.

Tex., Richmond June 26
For surf. 13.01 mi. St. Hwy. 36, \$156,004.—C. D. Myers, Co. Judge.

Wash., Colfax July 3
For surf. 11 mi. st. rd., crushed rock—Co. Comrs.

Wash., Okanogan July 6
For grad., drain. and surf. 1 mi. Perm. Hwy.—Bd. Co. Comrs.

Wash., Seattle 10 a.m., June 26
For const. Orillia-Kent Rd.—Bd. Co. Comrs.

Wash., Olympia July 5
For impv. Terrace Place, by clear., grubb., grad. and const. water mains and sewers—City Clk.

Wis., Racine June 24
For pav. and resurf. various sts.—Bd. Pub. Wks.

Wis., Madison 10 a.m., June 27
For grad. and surf. Ashland-Bayfield and Iron River-Burple Rds., and for rd. work on Alma-Mondovi Rd.—Wis. Hwy. Com.

SEWERAGE

Ill., Lake Forest 10 a.m., July 18
For sewage treatment plants and appurt.—North Shore San. Dict., Lake Co.

Ky., Paducah 10 a.m., June 28
For const. trunk line sewers and appurt.—Henry A. Pullian, Comr. Pub. Wks. and City Engr.

Mass., Boston noon, June 28
For sewerage works in West Roxbury—Jos. A. Rourke, Comr. Pub. Wks.

Mass., Boston noon, June 29
For sewerage works in West Roxbury—Jos. A. Rourke, Comr. Pub. Wks.

Minn., Graceville 4 p.m., July 7
For const. san. sewer system, incl. treatment plant, etc.—J. J. O'Connor, Vil. Clk.

N. J., Bloomfield 8 p.m., July 3
For storm sewer—Donald F. Peck, Town Clk.

N. J., Morris Plains June 26
For reconst. sewage disposal plant at state hospital, \$30,000.—B. G. Lewis, Comr., St. House.

N. J., Newark 10:15 a.m., June 26
For const. sewer.—Thos. L. Raymond, Dir., Dept. Sts. & Pub. Impvs.

N. J., West Orange 8:15 p.m., June 28
For const. san. and storm sewers—Henry C. Warnick, Town Engr.

N. Y., Richmond noon, June 29
For const. temporary san. sewer with appurt.—Matthew J. Cahill, Boro Pres.

N. Y., Thiells noon, July 13
For additions to sewage disposal plant at Letchworth Vil.—Mortimer B. Patterson, Pres., Bd. Vil. Mgrs., 7 Wall St., N. Y. C.

N. Y., Mount Morris 10 a.m., June 24
For const. extension to present outlet sewer.—Bd. Vil. of Mount Morris.

O., Cincinnati June 26
For const. 15-in. sewer on Minot Ave.—C. W. Handman, Business Mgr., Bd. Education.

O., Cleveland noon, June 30
For liquified chlorine gas for div. sewage disposal—Comr. Purchases & Supplies.

O., Toledo noon, July 6
For const. storm water regulators and connections—W. T. Jackson, Dir. Pub. Serv.

O., Perrysburg noon, June 30
For const. main outlet sewer in Elm St.—J. W. Lyons, Vil. Clk.

Ont., Elmira June 24
For const. 2,100 ft. 8-in. san. sewers—J. H. Ruppel, Town Clk.

Pa., Harrisburg noon, July 12
For const. public comfort station—W. H. Lynch, Supt. Sts. & Pub. Impvs.

Va., Roanoke noon, June 24
For const. sewer and sidewalks—W. P. Hunter, City Mgr.

Wash., Olympia July 5
For impv. alley in Block 74 by sewer—City Clk.

LIGHTING AND POWER

N. J., Jersey City 1 p.m., June 25
For furn. and installing st. lights, cables and equipment—Boulevard Comrs., Hudson Co.

Wash., Olympia July 5
For boulevard ltg. system on Main St.—City Clk.

WATER SUPPLY

Fla., Quincy 3 p.m., July 18
For water and power plant impvs. and water main ext.—City Council.

Ill., Chadwick 7 p.m., July 7
For water main ext., incl. c. i. pipe, special castings, 5 hydrants—L. A. Frank, Vil. Clk.

Ind., Hammond 2 p.m., June 26
For c. i. pipe, valves and valve boxes, etc.—Bd. Pub. Wks.

Ky., Hazard June 29
For const. 1,000,000 gal. filter plant, pumping station, reservoir, etc.—A. G. Taylor, City Clk.

Mich., Grand Rapids 2 p.m., July 6
For const. conc. conduits, filter plant ext.—G. J. Wagner, Dir. Pub. Serv.

Minn., Edgerton 2:30 p.m., June 26
For erect. flat bottom steel tank on present tower, 25,000 gal. capacity—C. H. Kingsbury, Vil. Clk.

Mo., St. Louis noon, July 11
For pumping engine with appurt.—E. R. Kinsey, Pres., Bd. Pub. Serv.

N. J., Bordentown June 28
For const. complete water supply system—Hill & Ferguson, 112 E. 19th St., N. Y. C.

N. Y., Manhattan 11 a.m., June 30
For transferring taps and rearranging connections on water mains, furn. pier lines and dock hydrants, and haul. and lay. water mains and appurt.—Nicholas J. Hayes, Comr. Water Supply, Gas & Elect., Mun. Bldg.

N. Y., Manhattan 10:30 a.m., June 28
For furn. wet connection sleeves and valves—Bd. Purchase, Grover A. Whalen, Chn., Mun. Bldg.

N. Y., Brighton 10 a.m., June 26
For furn. and lay. water pipe in cert. sts.—Water Comrs., Powers Bldg., Rochester.

N. Y., Buffalo 11 a.m., June 27
For piping, with valves, etc., for Col. F. G. Ward Pumping station.—Dept. Pub. Wks.

O., Toledo 10 a.m., July 6
For filter chemicals, 500 tons iron sulphate—Comr. Purchases & Supplies.

O., Girard 1 p.m., June 24
For const. steel standpipe, 300,000 gal. capacity—John L. Gleason, Dir. Pub. Serv.

O., Columbus noon, June 28
For chemicals for water dept.—W. H. Duffy, Pres., Bd. Purchase.

O., Montpelier 8 p.m., July 10
For water pipe, valves, etc.—Bd. Pub. Affairs.

Okl., Wewoka 8 p.m., June 26
For waterworks, inc. 2 sand filters, pump station, etc.—Benahm Engrg. Co., Gumbel Bldg.

Ont., Islington noon, June 26
For c. i. pipe, special castings, valves and hydrants, and lay. 8 mi. water mains—Clk.

Ont., Kincardine 2 p.m., June 27
For slow sand filters and equipment—Waterworks Com.

Pa., Morrisville 8:30 p.m., June 30
For filtration plant and appurt.—Town Council.

Tenn., Memphis noon, July 6
For steam generating and pumping equip.—Bd. Comrs., Memphis Artesian Water Dept.

Wis., Two Rivers 2 p.m., June 30
For const. 24 in. c. i. intake pipe line, suction well, etc.—Bd. Pub. Wks.

DRAINAGE AND IRRIGATION

Ark., Eudora July 1
For drain. work—Eudora Western D. D.

Ind., Brownstown 2 p.m., July 1
For const. drain—Ellias B. Douglas, Supt. Construction.

Ia., Pocahontas 1:30 p.m., June 29
For drain. work. in D. D. 114 and 59—C. W. Gilchrist, Co. Aud.

Minn., Waseca 10 a.m., July 7
For Jud. Ditch No. 8—Co. Aud.

Neb., Whitney 2 p.m., June 28
For const. irrigation system—Bd. Directors, Whitney Irrigation Dist.

O., Greenville June 24
For impv. Wise Ditch No. 24—Park Townsend, Co. Supvr.

FIRE

O., Cleveland July 5
For chemical hose truck, chemical tanks, hose reels, hose, etc.—Jesse L. Sadler, Vil. Clk., Bay Vil.

BRIDGES

Fla., Century June 27
For const. rein. conc. deck girder bridge, \$30,000.—W. E. Wheat, Engr., Pensacola.

Ind., Versailles 1 p.m., July 3
For repair of Walter Fitch bridge—W. D. Robinson, Co. Aud.

Ia., Onawa 1:30 a.m., June 26
For material and const. 20 items of bridge and culvt. work—Co. Aud.

Md., Annapolis noon, July 6
For const. hwy. bridge across South River.—Co. Comrs.

Md., Baltimore noon, June 27
For bridge over Severn River.—St. Rds. Com.

Mich., Grand Rapids 1:30 p.m., June 30
For const. 40-ft. span rein. conc. girder bridge—F. F. Rogers, St. Hwy. Comr.

Minn., Barnesville 9 a.m., June 24
For const. bridge—C. W. Williams, Town Clk.

Mo., Chillicothe 10 a.m., July 13
For const. 560 lin. ft. steel bridges—Grand River D. D. of Mo.

N. Y., Manhattan 2 p.m., June 28
For const. piers for bridge over Beach Channel—Grover A. Whalen, Comr. Plant & Structures, Mun. Bldg.

O., Mt. Gilead July 14
For const. superstructure and substructure of Bartlett bridge—M. A. Goff, Clk., Bd. Co. Comrs.

O., Cleveland June 24
For const. bridge work—Frank Lander, Co. Engr.

Pa., Middleburg June 24
For bridge in Snyder Co.—Chas. S. Matter, Clk., Co. Comrs., Court House.

Pa., Williamsport 10 a.m., July 11
For const. rein. conc. or steel bridge—Co. Comrs.

Quebec June 24
For 9 bridges on Nipissing div., 2 on Ottawa div. and 6 on Montreal div., \$250,000.—W. A. Kingsland, Gen. Mgr., Canadian Nat'l. Rys., Band of Toronto Bldg.

S. C., Union June 26
For bldg. bridges on Union-Whitmire Rd.—St. Hwy. Dept., Columbia.

Wash., Olympia 10 a.m., July 11
For const. steel bridge with conc. substructure—Jas. Allen, Supvr. Hwys.

MISCELLANEOUS

D. C., Washington Aug. 2
For 4 Diesel elect. hopper dredges.—Ch. of Engrs., 2902 Munitions Bldg.

Md., Baltimore 1 p.m., July 27
For dredging Wicomico River—U. S. Engr. Office.

Md., Baltimore 10 a.m., June 28
For automobile trucks for water dept.—Bd. Awards.

Mass., Boston noon, June 27
For two 2-ton trucks and scarifying rd. roller—Frank P. Rock, Supt. Supplies.

Mass., Boston noon, June 26
For asph. cem. for const.—Frank P. Rock, Supt. Supplies.

Mont., Butte June 28
For furn. 1,200 gal. combination st. flusher and sprinkler—City Clk.

N. J., Newark 10.15 a.m., June 26
For brick, st. signs, wiping solder, tile pipe—Thos. L. Raymond, Dir. Dept. Sts. & Pub. Impvs.

N. Y., Manhattan noon, June 30
For bldg. ramp and dumping board—John H. Delaney, Comr. Docks, Pier A, North River.

N. Y., Manhattan 10.30 a.m., June 27
For furn. asph. conc.—Bd. Purchase, Grover A. Whalen, Chn., Mun. Bldg.

O., Ashtabula 11 a.m., July 17
For const. rubble mound ext. of West Breakwater—U. S. Engr., Buffalo, N. Y.

Ont., Toronto noon, July 18
For 500 close waste paper and rubbish receptacles—C. A. McGuire, Chn., Bd. of Control.

Ont., Port Burwell June 28
For rebldg. breakwater, \$25,000.—R. C. Desrochers, c/o Dept. Pub. Wks.

EXPANSION

1. Type A—Fibre centre non-oozing joint (Solid crown and sides).
2. Type B—Bituminous cellular fibre joint (75% Bitumen).
3. Type D—Cellular fibre joint (solid edges and sides, self expanding).



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Type C—Sidewalk joint 1/4-in. a specialty.
For concrete Roads—Granite, Brick and Wood-block Paving Buildings—Bridges—Walls and Reservoirs.
Samples and Prices on Request.

SERVICISED PRODUCTS CO. 1ST NATL BANK BLDG. CHICAGO

Work Contemplated

STREETS AND ROADS

Alaska—Plan to const. 55 ml. rdway. Eagle River rd. will cost \$230,000.

Alta., Mosside—Council decided to purchase four new road graders.

Ala., Troy—Plans being prep. for const. roadways, paving.

Ala., Cook Springs—Meeting held to urge const. Bankhead hwy. through St. Clair Co.

Ala., Gadsden—City proposes to pav. var. streets.

Ark., Walnut Ridge—Ord. passed pav. and gravel streets.

B. C., Saanich—Council authorized paving of 1,000 ft. of Tyndall Ave. Clerk, H. S. Cowper.

Cal., San Rafael—Marin co. rejected bids for grad. and surf. Bolinas Co. Rd. Dist. 3.

Cal., Stockton—Plan to impv. streets in Searchlight Addn., 21,667 cu yds. out, 750 cu yds. fill, 19,805 lin. ft. conc. curb and gutter, 98,301 sq. ft. conc. walks, 355,072 lin. ft. 2 in. asph. mac. on 4 in. gravel. W. B. Hogan, City Engr.

Cal., Woodland—Yolo co. rejected bids for impv. Prefix 8, Sect. A. A. Proctor, Co. Engr.

Cal., San Bernardino—Bids late in June for conc. curb, cement and conc. culverts, 4 in. oiled mac. pav. and const. conc. wall on 17,750 ft. Hellman Ave. Rd. Dist. 17. H. L. Allison, Co. Clk.

Cal., Fresno—Bids rejected pav. 5 mi. Shaw Ave. C. P. Jensen, Cory Bldg., Co. Surv.

Cal., Amador—Will vote rd bonds in November. Amount not stated.

Fla., Fort Lauderdale—Broward County Commissioners, H. G. Wheeler, chairman, invite bids for widening Las Olos Blvd. from East St. to beach.

Fla., Coconut Grove—City voted \$60,000 of town hall, sewerage, street improvement and lighting bonds. The Mayor.

Fla., Clearwater—Petition submitted to widen South Fort Harrison Ave.

Fla., Tallahassee—Plans being prep. to pave College av. brk.

Fla., Orlando—Bids about June 20 for const. new rds in Orange.

Hawaii, Honolulu—City and Honolulu co. plans impv. Pal Rd., \$150,000, reclaiming 80 acres of reef between Kewalo Basin and Waikiki Canal; also building new concrete and asphalt road to connect boulevards, \$500,000. F. Ohrt, City Engr.; I. J. Hopu, City Deputy and Co. Clk.

Ida., Boise—State Hwy. Bureau plan subway road under Oregon Short Line R. R. tracks, \$24,000.

Ill., Pana—Survey completed for const. South Vine St. for pav.

Ind., Decatur—June 19, 1922, at 10 a. m., by treasurer of Adams county, for sale \$8,240, \$6,000, \$6,480, \$5,840, \$9,680 and \$4,720 hwy. improvement bonds, 4 1/2 per cent., 10 years. James Murphy macadam road in Root and Washington Twps., Simon Sprunger macadam road in Monroe Twp., Pleasant Grove macadam road in Union and Root Twps., Albert Shell macadam road in St. Mary's Twp., Emanuel Sprunger macadam road in Monroe Twp., Ernst Balsiger macadam road in French Twp., as on specifications. Hugh D. Hite, Treas.

Ind., Greensburg—June 29, 1922, at 2 p. m., by treasurer of Decatur county, for sale \$22,800 hwy. improvement bonds, 5 per cent., 10 years. C. A. Whipple et al. in Marion Twp., as on specification. Chas. B. Evans, Treas.

Ind., Princeton—June 21, 1922, at 10 a. m., by treasurer of Gibson county, for sale \$4,200 hwy. improvement bonds, 5 per cent., 10 years. Errett Williams et al. in Montgomery Twp. Stanford Witherspoon, Treas.

Ind., Nashville—July 3, 1922, at 1 p. m., by treasurer of Brown county, for sale \$11,000 and \$22,000 hwy. improvement bonds, 4 1/2 per cent., 10 years. Orville Brummet et al. in Jackson Twp.; H. B. Bolling et al. in Jackson Twp. L. J. Snider, Treas.

Ind., Noblesville—June 24, 1922, at 10 a. m., by treasurer of Hamilton county, for sale \$2,400 and \$3,200 hwy. improvement bonds, 4 1/2 per cent., semi-annually. E. A. Pritchard et al., Noblesville Twp.; A. W. Lowe, Noblesville Twp. A. G. Finley, Treas.

Ind., Shelbyville—June 24, 1922, at 10 a. m., by treasurer of Shelby county, for sale \$6,800 and \$9,760 hwy. improvement bonds, 5 per cent., 10 years. J. B. Monroe et al. in Noble Twp. Jasper Alyea et al. in Moral Twp. Geo. R. Carlisle, Treas.

Ind., Huntington—June 20, 1922, at 10 a. m., by treasurer of Huntington county, for sale \$9,340 and \$10,800 hwy. improvement bonds, 5 per cent., 10 years. Julius Rudig et al. in Polk Twp.; L. J. Rhamey et al. in Dallas Twp. J. Frank Barnes, Treas.

Ind., Petersburg—Plans prep. to const. 35 ml. rock and gravel rds.

Ind., Shoals—June 20, 1922, at 12 m., by treasurer of Martin county, for sale \$17,600 hwy. improvement bonds, 5 per cent., 10 years. S. P. Yenne et al. in Center and Halbert Twps. Theo. McCord, Treas.

Ind., Crawfordsville—June 20, 1922, at 10 a. m., by treasurer of Montgomery county, for sale \$3,500 hwy. improvement bonds, 4 1/2 per cent., 10 years. Geo. W. Hinkle et al. in Walnut Twp. Chas. H. King, Treas.

Ia., Cresco—Bids rejected for coating 32,000 sq. yds. conc. pav. 3/4 in. tarvia.

Kan., Ft. Scott—Bourbon co. prep. plan pav. 1 mi. F. A. P. 117, 18 ft., bit. mac. B. Boyle, Co. Engr.

Kan., Iola—Plan pav. 17.5 mi. F. A. P. 125, 127 and 128, incl. 9 mi. conc. from here to Fort Scott, 7.5 mi. var. types and 1 mi. conc.

Kan., Oswego—Plans pav. 24 mi. F. A. P. 126, 18 ft., gravel or bit. mac.

Ky., Louisville—Bd. Pub. Wks. orders new walks in var. streets. Bids June 21.

Ky., Frankfort—Tentative agreement made by St. Hwy. Comm. to const. road between Carrollton and Shelbyville, \$146,000.

N. C., Greensboro—Soon call bids for conc. pav. portions of Whitlington, Percy, North Spring and Douglass Sts., 5 mi.

Kansas—Bureau of Hgwys., Wash., D. C., approved const. hgwys. for Allen Co., .992 mi. conc. \$40,689; Wyandotte Co., 1.073 mi. conc., \$87,582.

La., New Orleans—City Comr. urges that petitions for paving be submitted before June 20.

La., Baton Rouge—Final adjustment of Hammond Hwy. supporters and State Hwy. Com. may result in completion of New Orleans-Hammond Hwy. \$1,400,000 bond issue proposed.

Maryland—\$1,500,000 state road bonds awarded to Alexander Brown & Sons.

Md., Baltimore—Bids July 15 for \$300,000 4 1/2 per cent. pub. rd. bonds.

Mass., New Bedford—Bd. of Aldermen consider widening Hillman St. Var. applications made for granolithic walks and driveways.

Mass., Springfield—City Planning Board considering relocation and grading Peconic Ave.

Mass., Boston—Ware-West Brookfield Hwy. bill defeated. Commonwealth will contribute \$4,000 toward cost of rd. if Hampshire and other towns will contribute.

- Mass., Adams.**—Plan to repair streets, sidewalks and gutters, \$40,000.
- Me., Portland.**—City Council considering widening of Free St., \$750,000.
- Mich., Lansing.**—Resol. passed to pav. Foster Ave. grad. and gravelled, also Regent St., Illinois Ave., pav. Elm St. and widen Ottawa St.
- Mich., Grand Rapids.**—\$1,445,000 to be expended for street and sewer impv.
- Mich., Monroe.**—Will vote June 20 on \$100,000 st. impv. bonds.
- Minn., St. Paul.**—City contemp. pav. Raymond Ave., \$130,000.
- Minn., Madison.**—Paving — Maturity Indef. Consult. Engr., John W. Schaffer & Co., 917 New York Life bldg., Minneapolis, has made survey. Abt. 40,000 sq. yds. M. T. Hoff, VII. Clk.
- Minn., St. Paul.**—Paving—Preliminary order introduced to city council for paving Western av. from University to Como av. H. W. Austin, City Purch. Agt.
- Minn., Georgetown.**—Sidewalk—Petn. circulated for 1 mi. walks. A. J. Ostby, City Clk.
- Minn., St. Paul.**—Resol. passed to extend and widen alley in Blk. 16.
- Mont., Great Falls.**—Govt. expected to approve Monarch Logging Rd. W. B. Wiley, Suprvs. of Jefferson Nat. Forest.
- Mo., St. Louis.**—Petition submitted to impv. Utah St. Bids about July 5 for pav. West Park Ave.; Marcus Ave., asph. conc. pavt.; Magaretta Ave., asph. pavt. and conc. curb.; Wren Ave., War. bit.; Skinner Rd., Waterman Ave., War. bit.; Clayton Ave., granite curb and Cl. A. conc. pavt.
- N. B., St. John.**—It is proposed to extend Millidgeville Ave. to the river.
- New Jersey.**—State Hgwy. Dept. plans impv. 5 mi. Highland Park, Metuchen Rd., \$500,000. T. F. Wasser, Broad St. Bank Bldg., Engr.
- N. J., Elizabeth.**—Ord. passed to impv. Second Ave. bit. mac. pavt.; also Third Ave.
- N. J., South Orange.**—Ordinance pass. to widen roadbed at intersection of Prospect st.
- N. J., Jersey City.**—Plans being prep. for widening section between Montgomery st. & Van Nostrand av.
- N. J., Hoboken.**—Bond issue for con. rds. in various counties proposed.
- N. J., Hoboken.**—Work in Plankroad will not begin until August.
- N. J., Newark.**—Bids rejected for imp. Swamp rd., Roseland & West Caldwell and approach to Hanover-Cook bridge, Mt. Pleasant av. & resurf. Franklin av.
- N. J., Babylon.**—A \$350,000 road bond issue has been submitted to the Town Board for its approval.
- N. J., Belleville.**—Ord. passed auth. \$18,000 road bonds.
- N. J., Hoboken.**—Horse Assn. of America has plans to develop and extend bridle paths in cities all over the country.
- N. J., Newton.**—Contracts for rd. work will be let as soon as State Hwy. Com. have approved plans.
- N. J., Hoboken.**—Notice given of proposed impv. of Linden Ave. and State St.
- N. Y., Albany.**—Plan being considered for hwy. from Albany to Cohoes by conversion at Old Erie and Champlain Canal beds.
- N. Y., Syracuse.**—New York State Railways will expend \$250,000 for paving replacements.
- N. Y., Mount Morris.**—Plan to issue \$78,000 bonds for const. new brk. pav. in Main and Chapel Sts. has been cancelled because of difference of opinion in narrowing Main St. State Hgwy. Dept. will survey street and new plans will be prepared.
- N. Y., Rome.**—Plans being prep. for const. roadways at Marcy division.
- N. Y., Oile Station.**—Monroe co. plans resurf. 1 mi. Scottville Rd., reconc., \$34,000. Co. Engr. Dept., Rochester, Engr.
- N. Y., Geneva.**—Plans road impv. and pav., \$110,000.
- N. Y., Gouverneur.**—Plans pav. John St. conc., \$35,000. A. M. Jepson, VII. Clk.
- N. Y., Lackawanna.**—Plans pav. Kirby Ave., \$30,000. B. McDonnell, Comr. Pub. Wks.
- N. Y., Rensselaer.**—Plans resurf. East St., \$25,000-\$30,000. L. Greenalch, City Engr.
- N. Y., Boro. Bronx.**—Resol. passed to acquire property from Cedar Ave. to easterly line of New York & Putnam R. R. for widening of and laying out of street.
- N. Y., Mt. Morris.**—VII. Bd. Trustees plan pav. Main and Chapel Sts., brk., \$85,000.
- N. Y., Boro. Queens.**—Plans being prep. for grad., curb., flag. and pav. Lent, Lurting, Merritt Sts. and Lewis Ave.
- N. Y., Boro. Bronx.**—City plans grad., pav., reg. and sewers in Taylor Ave., Guerlin Pl., Archer St., Theriot Ave., Gun Hill Rd., Norris Ave., E. 135th St., Exterior St., Guion Pl. and Transverse Rd.
- N. Y., East Rochester.**—Plans being considered for pav. East Elm St. and Lincoln Rd.
- N. Y., Rochester.**—City Com. contemp. impv. 21 streets asph. pav.
- N. C., Charlotte.**—Plans to const. 12 mi. Lawyers Rd., asph. on 5 in. conc., \$390,000.
- N. C., Avery Co.**—Rd. Comrs. calling bids for \$50,000 road bonds July 3 for Elk and Elk Park Rd. Dists.
- N. C., Danbury.**—Stokes Co. Comrs. passed resolution for issuance of \$150,000 bonds for road const.
- N. C., Raleigh.**—Contracts for 55 mi. hwy. will be let June 28.
- N. D., Tower.**—Road—McHenry co. Survey being made by T. R. Atkinson, of St. Highway Commission, Bismarck, for F A P from Velva to Ward co. line, on Valley rd. Start wk. soon.
- O., Parma Heights.**—About to vote \$6,000 rd. bonds.
- O., Ashland.**—Ord. passed auth. \$6,000 st. bonds.
- O., Middletown.**—Ord. passed auth. \$18,000 M. & S. street bonds.
- O., Norwood.**—Ord. passed auth. S. S. imp. bond issue, \$18,400.
- O., Delaware.**—Plans being made for impv. of Center Village Vans Valley and Condit North Rd.
- O., Fremont.**—Prelim. plans prep. for impv. 3 mi. McPherson Hgwy.
- O., Warren.**—Plan to pav. Mason St., Garden Ave. and sewerage Parkins Wood Blvd., pav. Hillside Dr., S. Chestnut, repav. Hill Ave. and pav. walk on south side at High St., \$102,000.
- O., Hamilton.**—Plan to pav. 6 sts. on wes side and const. blvd. lighting sys.
- O., Massillon.**—Plan to repav. and repair many sts., incl. drain., curb. brk or blk., bids soon.
- O., Lisbon.**—Plan to impv. Petersberg Rd., conc. on mac.
- O., Delaware.**—Co. Comr. plan to sell \$103,450 rd. bonds. June 29.
- O., Delaware.**—Plan to impv. Euclid-Pennsylvania av. rd.
- O., Cleveland.**—Com. Garfield Heights plan repair Broadway.
- O., Wapakoneta.**—Plan pav. Willipie and Wood Sts.
- O., Akron.**—Resolution passed to impv. School St. and Lakemont Ave.
- O., Toledo.**—Resolution passed by Twn. Maurice for impv. River Rd., widening to 32 ft.
- O., Toledo.**—\$200,000 road bonds sold for impv. county roads.
- O., Cleveland.**—These paving projects are pending: Bellaire, paving outlying streets, for which a bond issue of \$80,000 has been approved. C. E. Corlett, Clk., Bellaire. Paving West Washington St., Cuyahoga Falls; paving Sackett St. and constructing sewer and water lines on Broad. Dayton, paving W. 5th St. to Western Ave., Erie, Pa. Portsmouth, paving 6 mi. of road between here and Ironton, surveys for which are being received.
- O., Ironton.**—Resol. passed to impv. Seventh St.
- O., Barborton.**—Plan to pav. High St., grad. Baird and East Tuscarawas Sts.
- O., Ravenna.**—Plan to pav. S. Diamond and W. Highland Sts. conc. and brk.
- Okla., Morris.**—Bids soon for pav. 12 streets south of Frisco, gravel with asph. top, \$126,000. R. Ward, Mayor.
- Okla., Stigler.**—Plans 12,000 sq. yds. pav., \$55,000. V. V. Long & Co., Calcord Bldg., Oklahoma City, Engrs.
- Ont., Leamington.**—Preparing plans paving John and Wellington Sts., concrete, \$28,000. Prices wanted on all materials. R. M. Selkirk, City Engr.
- Ont., Merriton.**—Plans paving Main St. from Church Corner to Thorold town line, \$50,000.
- Ont., Sandwich.**—Hydro-Electric Power Commission of Ontario plans to grade the roadbed between the car tracks on London St.
- Ont., St. Thomas.**—Construction of an asphalt pavement on Wellington St. from Ross to Elgin Sts., is planned. City Engineer, W. C. Miller.
- Ont., St. Thomas.**—Construction work on proposed ravine driveway is to be started from the Hiawatha St. entrance shortly. City Engr., W. C. Miller.
- Ont., Toronto.**—City Council intends to construct a concrete walk on Don Rdway, east side, from Eastern Ave. to Queen St., at a cost of \$2,910.
- Ontario, Province of.**—Highway Dept. is calling for tenders for the paving of a 20-ft. strip of roadway on the west side of the radial tracks on Yonge St., Toronto, from the Mausoleum to the southern end of the paved stretch at Newmarket.
- Ont., Ailsa Craig.**—Following tenders were received by Ailsa Craig Farmers' Co-operative Association for construction of concrete grain tanks and warehouse: Jos. Lawson, Crediton; E. Barnes, Ailsa Craig; A. K. Stewart, Parkhill.
- Ont., Peterboro.**—Board of Works tabulated a list of proposed repairs and improvements on streets which they sent on to Council for approval. City Engr., R. H. Parsons.
- Ont., Toronto.**—Lowest tenders received by Board of Control for three sections of paving on Lake Shore Rd. total \$143,802.
- Ont., Toronto.**—Board of Education has asked the Works Committee to construct sidewalks on Haig Ave., south of Coxwell Ave., in connection with the Earl Haig School.
- Ontario, Province of.**—A provincial highway is to be built from Port Erie to Port Colborne connecting with the concrete highway to Welland.
- Ont., Toronto.**—Works Committee again recommended the widening of Jane St. in West Toronto to 86 ft. at a cost of \$80,000.
- Ont., Toronto.**—Works Commissioner R. C. Harris urged the members of the Civic Works Committee to reach a definite conclusion, at the earliest possible moment, regarding the widening of Yonge St. north of the C. P. R. tracks to Lawton Ave., so that there may be no unnecessary delay in the double-tracking of that thoroughfare as soon as the Transportation Commission is ready to proceed with the work.
- Ont., Toronto.**—If suggestions made by Chief of Police S. J. Dickson to the Ontario Motor League materialize, the roadways of a number of the downtown streets will be widened from one to five feet to accommodate the growing volume of motor traffic. The proposals have been taken up by the executive of the Ontario Motor League and the secretary, W. G. Robertson, has forwarded a letter to the Board of Control recommending their adoption.
- Ont., Paris.**—The estimated expenditures for this year include the following items: Street oiling, \$2,000; streets, roads and bridges, \$7,000, and concrete walks, \$500. Clerk, C. B. Barker.
- Pa., Camden.**—Coun. plans to pav. 15 sts.
- Pa., Pittsburgh.**—Plan being prep. for Mount Washington Rdway. \$22,000, 000 bond issue being prep.
- Pa., DuBois.**—The 1922 paving program providing for the construction of paving on nine streets has been adopted and bids are to be invited at once on five streets. The city's share will cost \$21,000.
- Pa., Warren.**—Street Comm. of Town Coun. are engaged in figuring out a plan whereby sheet asphalt can be spread over the asphalt block on Market St.
- Pa., York.**—The York Co. Comrs. have authorized the issuance of bonds for the loan of \$1,000,000 for road construction in the county during the year.
- Pa., McKeesport.**—The City Council sold to the J. H. Holmes Co. of Pittsburgh, \$135,000 worth of street impv. bonds that are to draw 4½ per cent. interest. A premium of \$3,245 was paid.
- Pa., Erie.**—Ord. passed to grad., curb, drain. and pav. Twenty-third St.
- Pa., Erie.**—Plans, grad., pav. and curb. Plum St., brk or blk., cement sidewalks on 29th, 20th, French, Raspberry, 25th and Cranberry Sts., \$25,000.
- Pa., Kittanning.**—Plans pav. 4 mi. Kaylor Rd. from Allegheny River to Kaylor, \$200,000.
- Pa., Sharon.**—Bids about July 5, new pavts. on 4 streets, resurf. 5 streets, reconst. East State St., brk. and asph.; also trunk san. sewers in Clark Ave. and Union St. and sewers in var. sts., \$55,000.
- Pa., North Catasqua.**—Will resubmit \$35,000 st. bond issue.
- Pa., Northampton.**—\$2,000,000 rd. imp. and bridge const. bonds voted.
- Que., St. Lambert.**—Work is to be started soon on a bitulithic surface for Front St. and the River Road as far as the limits of St. Lambert, while the 1,700 ft. of unimproved surface in Montreal South is also to be reconstructed.

Que., Montreal—Soon takes bids for cement sidewalks on Clark St. from Kelly to Boileau Sts., \$9,112; Clark St. from Kelly to Dick Sts., \$5,765; Lasalle Ave., Dandurand, Delormier, Mentana and Charlemagne Sts., totaling \$10,390. E. Blanchard, Road Supt.

R. I., Coventry—Coun. plans to permanently repair Lincoln Ave.

Saskatchewan, Province of—Highways Department will build road leading into Piapot.

S. C., Aiken—City plans hard surfacing one mile of Park Ave.; concrete, brick or asphalt. The Mayor.

S. D., Sioux Falls—Resol. passed to grad. Fourteenth St. Petit. submitted to grade Eighth St.

South Dakota—Bureau of Hgways. Wash., D. C., approved proposed const. rds. in Miner Co., 5.5 mi. G. & D. const., \$19,492; Lincoln Co., 7 mi. G. & D. const., \$18,177; Brown Co., 6 mi. gravel, \$127,555.

Tex., Dallas—New pavement for ten sts. provided for in st. impvt. budget.

Tex., Dallas—Contracts will be awarded June 30 for const. 13.43 mi. mac. and gravel base rd.

Tex., Coleman—Plans submitted to State Hwy. Dept. for const. hwy., gravel and conc., \$90,000.

Tex., Waco—Plan submitted for const. hwy. and rd. in McLennan Co., bit. mac. re-conc., \$320,050. J. P. Lester.

Tex., Georgetown—Plan const. rd. in Williamson Co., \$100,000, gravel surf. and conc.

Tex., Coleman—Plans being prep. for const. rd., gravel surf. and conc., \$132,400. W. E. Dickerson.

Tex., Lufkin—Plans being prep. for Hwy. No. 35 in Angelina Co., grav. surf. and conc., \$75,000. John F. Robinson.

Tex., San Angelo—Plans being prep. for const. Hwy. No. 9-A, \$65,000. Gibb Gilchrist, Engr.

Tex., Waco—Plans being prep. surf. and rock grav. and bit. topping hwy., \$110,000.

Tex., Clarksville—Plans being prep. grad. and gravel surf. 3.5 mi. St. Hwy. 5, \$25,000. Gravel furn. by county. J. B. Riegan, Clarksville, Engr.

Tex., Georgetown—Bids about July 27, pav. 7 mi. var. sts., bids on conc., gravel and rock base; also several types asph. top, \$200,000. W. N. Harris, Engr.

Tex., Seguin—Guadalupe co. plans grading and gravel surf. 3.4 mi. State Hwy. 3, between here and San Antonio, 13,194 cu. yds. borrow, 10,538 cu. yds. roadway, 660 cu. yds. concrete, 9,160 cu. yds. gravel surfacing, 86,240 lbs. reinforcing, \$36,700. Hess & Skinner, Southwestern Life Bldg., Dallas, Engrs.

Tex., Richmond—Fort Bend co. voted \$500,000 bonds for hwy. improvements in Rd. Dist. 1. Nagle-Witt-Rollins Eng. Co., Wharton, Co. Engr.

Tex., Young Co.—\$300,000 rd. bond issue proposed.

Tex., Corsicana—Will soon vote on a street bond issue, amount of which is not stated.

Tex., Canyon—Voted in favor of issuing paving bonds. (Amount not stated.)

Tex., Jefferson Co. (P. O. Beaumont) Road District No. 1—Attorney General Austin approved \$2,000,000 5% sr. road bonds.

Tex., Falls Co. (P. O. Maclin)—Recently voted \$100,000 5% road bonds. E. M. Dodson is Co. Judge.

Utah, Sevier Co. (P. O. Richfield)—An issue of hwy. bonds \$240,000 has been voted.

Va., Franklin Co. (P. O. Rockymount)—An issue of road bonds \$50,000 has been proposed.

Va., Newport News—Plan to vote \$300,000 paving bonds.

Va., New Canton—Plans completed for const. of tri-country hwy. hard surf., curb and gutter.

Va., Princess Anne—Princess Anne co. plans 4 mi. concrete road from Kempville to Salem Church. J. C. Wood, Chn. Bd. Supervs.

Va., Portsmouth—Norfolk co. plans to issue \$110,000 bonds for concrete road in Great Bridge Dist. R. B. Preston, New Klrn Bldg., Co. Engr.

Va., Petersburg—Pembroke Land Corp. will develop residential section at outskirts of here, incl. streets, walks and sewers, \$50,000. B. C. Syms, Pres. Engr. not selected.

Va., Norfolk—Appropriated \$25,000-\$30,000 to pave portions of Manteo and Fancher Sts.; also drain part of 34th St. Work will probably be done by day labor. C. E. Ashburner, City Mgr.

Wash., Hillyard—Ptn. submitted for pav. impvt. in two avs.

W. Va., Charleston—Bids about July 11 for impvt. rds. in 13 counties. Grad drain pay. & tar cold surf. application.

W. Va., Moundsville—Rejected bids opened May 25, paving Jefferson and Morton Aves. Will readvertise. Noted May 18.

Wis., La Crosse—Paving—Will take bids soon. Approx. 8 mi. Alt. bids on brk., asph., concr. and asph. macadam. A. Birnbaum, City Clk.

SEWERAGE AND SANITATION

B. C., Saanich—By-law providing for an ultimate issue of \$750,000, of which \$270,000 will be raised immediately to inaugurate sewerage system in the municipality, will shortly be submitted to the ratepayers.

Cal., Williams—Election soon to vote on bonds for constructing sewerage system. C. F. Sloan, Santa Fe Bldg., San Francisco, Consult. Engr.

Cal., Stockton—Plans prep. const. North St. San. Proj., 210 lin. ft. 4 in. and 1,694 lin. ft. 6 in. pipe, etc.; Fair Oaks N. San. Proj., 12,730 lin. ft. 4 in. and 15,900 lin. ft. 6 in. pipe, etc.

Cal., San Pablo—Plans prep. for Chelsea Ave. Lat. Sewer 2, 23,408 lin. ft. 6 in. vitr. pipe; Market St. Lat. Sewer 1, 28,740 lin. ft. 6 in. and 2,300 lin. ft. 8 in. vitr. pipe; Church St. Lat. Sewer 3, 8,008 lin. ft. 6 in. and 655 lin. ft. 8 in. vitr. pipe; Belmont Ave. Lat. Sewer 4, 3,364 lin. ft. 6 in. vitr. pipe. R. Calfee, 221 South 22nd St., Richmond, Engr.

Cal., San Luis Obispo—Voted \$20,000 bonds for sewer impv.; \$15,000 bonds for septic tank; \$8,500 bonds for culverts; \$15,000 bonds for bridges. W. B. Burch, Lowe Bldg., Engr.

Cal., Merced—Election soon to vote 60,000 bonds impv. and enlarging sewers, \$60,000.

Cal., Alhambra—\$300,000 sewer bonds voted.

Fla., Deland—Election will be held soon to vote on \$90,000 bond issue for construction of sewers. J. B. McCrary Co., 3rd Natl. Bank Bldg., Atlanta, Ga., Engrs.

Ill., Monmouth—Plans being prep. for two sewers.

Ill., Chicago—Plans prep. for Lake View relief sewer for city Bd. Local impv., \$2,000,000. C. D. Hill, Engr.

Ia., Council Bluffs—Sewer—Resolution adopted to const. san. sewer on 8th st., bet. 16th & 24th avs. 1,334'6", 1,050' 8", 1,190' 10" 800' 12" vit. pipe, 6 m. hs. O. Hochman, City Clk.

Ia., Blairtown—Prep. plans and opening bids about Aug. 1 for 3 mi. 6-12 in. san. sewers, \$32,000. M. Tschirgi & Son, 711 Amer. Trust Bldg., Cedar Rapids, Engrs.

Md., Baltimore—Bids being called for sewage disposal plant in Crownsville.

Md., Hagerstown—Plan to extend city sewerage sys., \$117,930.

Mich., Menominee—Will soon take bids for 24 and 30 in. vitr. sewers in Jenkins St., Elizabeth, Wells and Somerville Aves., \$25,000.

Mich., Detroit—Had plans prepared 4,937 ft. sewer in Trombley Ave. from St. Aubin to Mt. Elliott Aves., 4 ft. to 6 ft. 3 in. diam.; 3,853 ft. Harper Ave. Arm. Sect. 1 of Ashland Ave. Sewer, in Harper Ave. from Alter Rd. to point 1,967 ft. north of Harper Ave., 4 ft. 3 in. to 8 ft. 6 in. diam.; 2,813 ft. Harper Ave. Ext. of Ashland Ave. Sewer, in Harper and Nelson Aves. from Newport to Wade Aves., 3 ft. 3 in. to 4 ft. 3 in. diam.; 2,669 ft. Carrie Ave. Arm of North Six Mile Rd. Sewer, in Carrie Ave. from Six Mile Rd. to Nevada Ave., 3-5 ft. diam.; 2,905 Moran Ave. Arm of McDougall Ave. Sewer, in Leland Ave. from McDougall to Moran Aves., and Moran Ave. from Leland to Garfield Aves. 20-45 in. diam., brick, monolithic concrete or vitr. segment block. J. W. Reid, City Engr.

Mich., Adrian—The City Commission has voted to construct six sewers this summer and also to build seven stretches of curb and gutter, also in 1922.

Minn., Graceville—Sewer Sys. Disposal Plant—Ready for bid soon. Consult. Engr. W. E. Buell, 205 Davidson bldg., Sioux City, Ia. 10,000' 15" and 4,500' 8" sewer. A. W. Bruers, City Clk. \$30,000.

Minn., Harmony—Sewers — Engr., Louis P. Wolff, 1000 Guardian Life bldg., St. Paul, making plans for complete sanitary sewer sys. T. Sanderson, Jr., City Clk.

Minn., Chaska—Sewers — Consult Engr., John W. Schaffer & Co., 917 New York Life bldg., Minneapolis, making plans. J. B. Connolly, Vil. Clk.

Minn., Rochester—All bids rejected for const. storm sewer.

Minn., Columbia Heights (P. O. Minneapolis)—Sewers — Maturity indef. Consult Engr., John W. Schaffer & Co., 917 New York Life bldg., Minneapolis, has made survey.

Mo., Cameron—City Council retained Benham Engineering Co., Kansas City, Mo., as consulting engrs. for impvs. to sewage disposal plant.

Mo., Kansas City—An election to vote an issue of sewage disposal bonds to the amount of \$4,000,000 is being contemplated.

Neb., Grand Island—Storm, San. Sewer Sys., Sewage Disposal Plant—Voted to issue \$300,000 bonds. Henry E. Clifford, City Clk. W. E. Buell & Co., 205-7 Davidson bldg., Sioux City, Ia. Engr.

Neb., Emerson—San. Sewers—Ready for bids abt. July 1. Consult. Engr., W. E. Buell & Co., 205 Davidson bldg., Sioux City, Ia. 26,000'. Care City Clk. \$47,000.

N. B., St. John—A new system of sewerage for the Shamrock grounds is being considered. R. W. Wignmore, Commissioner of Water and Sewerage.

N. J., Haddon Heights—Bids rejected for ext. sewerage system.

N. J., Irvington—Bids being called for const. storm sewer.

N. J., Boro Garwood—Ord. passed to const. 15 in. vit. pipe drain, catch basins, manholes, etc., in Third Ave., also lateral sewer in New St. and Willow Ave.

N. Y., Elmira—City will sell \$200,000 bonds for impv. and building new sewers. G. W. Jarchow, Clk.

N. Y., Canandaigua—Will offer soon \$120,000 sewer disp. bonds.

N. C., Madison—Bd. Aldermen to sell \$30,000 bonds on June 30, to construct sewerage system. J. C. Thompson, City Clk.

N. D., Carrington—Sewage Disposal Plant—Engr., Louis P. Wolff, 1,000 Guardian Life bldg., St. Paul, has made plans. Maturity indef. C. C. Carnahan, City Clk.

O., Maple Heights—It is proposed to const. sewerage system (segment block and some brick) and sewage treatment station, \$300,000. C. W. Courtney, Leader-New Bldg., San Francisco, Consult. Engr.

O., Cleveland—Plans being prep. for sewage impv. in Cuyahoga county, \$70,000. R. F. MacDowell, Engr.

O., Cincinnati—Bids being called for const. sewer.

O., Columbus—Bd. Comrs., Franklin co., plans sanitary sewer in territory east of Parsons Ave. from Klan Ave. to Marion Rd. and in Marion to Lockbourne Rds., 15, 18 and 24 in. at var. places, \$27,700.

Ont., Toronto—City Council intends to construct sewers in Dewson St. at a cost of \$3,980.

Ont., St. Thomas—Work on the construction of the sanitary sewer under the eastern end of Malakoff St. will be started shortly, work to be done by day labor. No. 2 Committee of City Council also recommended installation of sanitary sewer under Hiawatha St. by day labor. City Engr., W. C. Miller.

Pa., Erie—Plans 8, 9 and 12 in. tile sanitary service in Elmwood Ave., 28th, 29th, 30th and Cherry Sts., total \$27,100. F. G. Lynch, City Engr.

Pa., Verona—Bids about June 26 for const. storm sewer.

Pa., Johnstown—\$700,000 san. sewer bonds being offered.

Que., Montreal—It is planned to const. brick sewer in several streets, \$64,780. F. V. Dowd, Ass't. Supt., Sewer Dept.

S. D., Redfield—Sewer — Contemp. storm and san. sewers and sewage disposal plant. C. J. Mariner, City Aud.

Tex., Jackson—\$70,000 sewer bonds voted.

Tex., Dallas—Will soon offer \$100,000 sewer bonds.

Tex., Jacksboro—City will const. sewer system; voted \$70,000 bonds.

W. Va., Clarksburg—City will const. storm and sanitary sewer on W. Main St.

Wis., South Milwaukee—Bids being called for const. sewers.

Wis., Whitefish Bay—City contemp. const. sewers, water mains and pav., \$60,000.

Wis., Watertown—Bd. Pub. Wks. contemp. san. sewer.

Wis., Hurley—Sewer Improv.—Contemp. J. A. Emunson, City Clk. \$19,500.

Wis., Westby—Sewer Sys.—Plans in prog. O. L. Leum, City Clk. W. G. Kirchoffer, Madison, Engr.

Wis., Fond du Lac—San. Sewer—Contemp. on Griffith st. bet. Morris st. & river. A. M. Hunter, City Clk.

LIGHTING AND POWER

Ala., New Brockton—City will vote on issuance of \$8,500 of bonds for improving electric light system. The Mayor.

Fla., Jacksonville—Application filed to obtain power from Ochlocknee River by West Florida Power Co.

Fla., Coconut Grove—City voted electric light bonds. The Mayor.

Fla., Jacksonville—Schofield Engineering Co., Philadelphia, Pa., is consulting engr. for improvements to municipal electric plant; to install 10,000 K. W. generator, doubling capacity; estimated expenditure, \$280,000. City Comrs.

Fla., Homestead—An election will be held on July 5 to vote an issue of electric, water, paving and fire department bonds, \$115,000.

Mo., Missouri Valley—An election will be held on June 19 to vote an issue of electric light plant bonds, \$80,000.

Md., Baltimore—Plan to develop huge hydro-electric plant on Susquhanna between tidewater and plant at Haltwood.

Mich., North Muskegon—An election will be held to submit to the voters the question of issuing electric extension bonds, \$30,000.

Pa., York Haven—York Haven Water & Power Co. plan to expend \$1,000,000 for impv. of plant.

Pa., Harrisburg—City auth. 22 more street lights in city.

Wis., Muscoda—\$15,000 electric light bonds voted.

WATER SUPPLY

Ala., Auburndale—City voted \$30,000 bonds for const. of water works.

Ark., Russellville—City contemplates erecting water and light plant. The Mayor.

Ark., Lepanto—The following bonds have been authorized: \$34,000 water, \$32,000 electric light, \$28,000 sewer.

Cal., Hermosa Beach—Election soon to be held on \$500,000 bond issue for following improvements: Buying present privately-owned water works systems; sewerage system; auditorium on pier; extending present pier 300 ft. into ocean; purchasing fire fighting apparatus.

Fla., Winter Garden—Town voted \$33,000 bond issue for const. water works. R. B. Haddon, Mayor.

Fla., Deland—Plans have been prep. for const. water works. Election soon to vote on \$116,000 bonds. J. B. McCrary Co., 3rd Natl. Bank Bldg., Atlanta, Ga., Engrs.

Ill., Joy—Plans being prep. for waterworks sys. \$35,000. Coldwell Engr. Co., Jacksonville, Ill., Engr.

Ill., Shelbyville—Ord. passed approp. \$5,300 for water purposes.

Ia., Oskaloosa—Plans being completed for water wks., \$300,000. Burns & McDonnell, 402 Interstate Bldg., Kansas City, Mo., Engr.

Ia., Oskaloosa—Voted \$230,000 bonds to purchase water works, \$70,000 to improve same and \$370,000 for hydro-electric development on Des Moines River. Burns & McDonnell, Interstate Bldg., Kansas City, Mo., Engrs. Noted Oct. 6 and Dec. 22.

Ia., Storm Lake—Waterwks Improvs. Voted to issue \$40,000 bonds. Roy W. Kinne, City Clk.

Ia., Belle Plaine—A recent election resulted in favor of issuing \$50,000 water works extension bonds.

Kan., Phillipsburg—Plans 6½ mi. 8 in. mains, purification plant, pumping plant, etc., \$100,000. Black & Veatch, Mutual Bldg., Kansas City Mo., Engrs.

La., Alexandria—\$360,000 bond issue voted for water reservoir mains, fire dept. and gas plant.

Md., Williamsport—\$100,000 municipal bonds voted for water sys.

Me., Auburn—City will soon take bids for main extension from Lake Auburn pumping station, 12,000 ton c. i. pipe. A. W. P. Cobb, Clk., Water Comm.

Mich., Redford—City will lay 65,810 ft. of 4-24 inch cast iron water mains and construct pump house, etc. Detroit Water Bd., Detroit, Engrs.

Mich., Lansing—Will soon offer \$10,000 water and sewer bonds.

Mich., Iron Mountain—Water Sys.—Work to start soon. Michigan Iron, Land & Lmbr. Co. Filtration plant on Woodward Ave.

Minn., Storden—Waterwks—Plans in prog. Consult. Engr. W. E. Buell & Co., 205 Davidson Bldg., Sioux City, Ia. City Clk., P. B. Hiebin.

Minn., Edgerton—Water Sys.—Voted to erect water tank, extend water mains, sink well, erect pump house. C. H. Kingsbury, City Clk.

Minn., Stephen—Waterwks Sys.—Maturity indef. Will vote on bond issue. Engr. Louis P. Wolff, 1000 Guardian Life Bldg., St. Paul, has made survey. O. G. Gunderson, Vil. Clk.

Minn., Winsted—Waterwks Sys.—Maturity indef. Consult. Engr. John W. Schaffer & Co., 917 New York Life Bldg., Minneapolis, has made survey. About \$50,000. Fred Rouf, Clk.

Minn., Fridlay—City Coun. contemp. waterworks sys., \$2,000,000. Maturity indef.

Minn., Minneapolis—City Coun. contemp. waterworks ext. about Aug.

Minn., Springfield—Water works extensions are planned, \$22,000. Druar & Milnowski, 500 Globe Bldg., St. Paul, Engrs.

Minn., Edgerton—Plans are being made for water works impvs., incl. new steel tank, 25,000-30,000 gal. capacity, on old tower, and city is considering extending mains, sinking new well, purchasing new pump and building new pumphouse. Engr. not selected.

Mo., Katesville—Vote will probably be taken in near future on bond issue for installing water works.

Neb., Phillips—Waterwks Sys.—Contemp. 35,000 gal. tank on 100 ft. steel tower. E. C. Huxtable, City Clk.

Neb., Lincoln—Plans laying mains in Dist. 30, 51st St. from South to Sumner Sts., 52nd St. from South to Sumner Sts., 53rd St. from South to Franklyn Sts., 58th St. from South to Franklyn Sts., Franklyn St. from 53rd to 58th Sts.; Dist. 31, Pawnee St. from 14th to 17th Sts., 1965 ft. 6 in. and 4,470 ft. 4 in. c. i. pipe. G. W. Bates, City Engr.

Neb., Hay Springs—An election will be held on June 20 to vote an issue of water works bonds to the amount of \$18,000.

N. J., Trenton—Sealed proposals will be received until June 16 for furnishing and erection of one Ames Unaflow engine, one Root rotary pump, one electric generator, one condenser and one atmospheric check valve. Leon D. Hirsch, City Clk.

N. Y., Kenmore—Village plans the following impvs.: (1) extensions to water mains and general impv. of water system, \$13,000; (2) const. of new sewers in 5 streets, \$11,368.75. Engr. not announced.

N. Y., Caledonia—Town of Wheatland will take action June 19 on petition from Munford for establishment of water dist., \$24,333.

N. Y., Riverport—City will soon take bids on 200,000 gal. steel tank and tower; also 4-8 in. mains. W. P. Webber, City Engr.

N. Y., Greece (Ridge Road Fire Dist. (P. O. North Greece)—A recent election resulted in favor of issuing fire truck bonds to the amount of \$10,000.

N. C., Madison—City will const. water and sewer systems; voted \$100,000 bonds.

N. C., Kernersville—City voted \$58,000 bonds for const. of water works system. Carolina Eng. Co., Wilmington, Engrs.

N. C., Madison—Bd. Aldermen to sell \$70,000 bonds, on June 20, to construct waterworks system. J. C. Thompson, City Clk.

N. C., Kernersville—\$105,000 water and sewer bonds voted.

O., Cleveland—Plans being prep. impv. water mains. R. F. McDowell, Engr.

O., Salem—City will soon take bids on rein.-con. reservoir, tank house, pipe lines, etc. Morris Knowles, Jones Law Bldg., Pittsburgh, Pa., Engr.

O., Rome—Franklin co. (Columbus) plans laying 1½ mi. 6 in. pipe, pump and standpipe; also drilling 8 in. well, 175 ft. deep, here. E. T. Bradbury, Gule Bldg., Columbus, Engr.

Okla., Granite—Voted \$20,000 bonds constructing waterworks. V. V. Long & Co., Colcord Bldg., Oklahoma City, Engrs.

Ont., Thornbury—City is having plans prepared for new water works system, \$30,000. Prices are desired on pumps, pipe, etc. James, Proctor & Redfern, 36 Toronto St., Toronto, Engrs.

Ont., Woodbridge—Plant for water works system are being prepared, \$25,000. James, Proctor & Redfern, 36 Toronto St., Toronto, Engrs.

Ont., New Toronto—Reeve Gardhouse will propose the submission of a by-law for debentures for a waterworks system from New Toronto to serve Long Branch and the Lake Shore Road district as far west as Etobicoke Creek, south of the Grand Trunk Railway tracks.

Ont., Riverside—Carlottle Bros., Walkerville, secured contract for construction of cast iron water main on Clair View, Elinor and John M. Sts., and also from Eau Claire water plant to Little River.

Ont., Sarnia—With the approval of the City Council, the waterworks committee accepted tenders for annual supplies, as follows: Gartshore-Thomson Pipe & Foundry Co., Hamilton, 4 and 6-in. cast iron pipe at \$57 per ton; Kerr Engine Co., 4-in. valves, \$9.55, 6-in. valves, \$16.33; Mueller Mfg. Co., valve boxes, \$7.86; pig lead, \$6.25 per hundred pounds; Dominion Steel Products Co., fire hydrants, \$66 each.

Ont., York Twp.—Township Council authorized an expenditure of \$11,982.30 for 6-in. water mains. Engr., Frank Barber, Toronto.

Ont., Islington—A water supply scheme to take in the area from the west of New Toronto east to Long Branch Park, and south from the railway to the lake, at an estimated cost of \$98,000, was submitted to the Etobicoke Township Council by James, Proctor and Redfern, Ltd., Consult. Engrs., Toronto.

Ore., Toledo—\$22,500 water ext. bonds voted.

Pa., Lawrenceville—Plans waterworks system. Cost between \$25,000 and \$30,000. Address H. C. Cloos, Lawrenceville, Secy.

Pa., Philadelphia—City will soon call for bids on installing ash and coal handling equipment at Queens Lane pumping plant. About \$25,000. Bids will also be called for on furnishing and installing pumping units at Larners Point pumping station, \$35,000, and for quantity of patent sleeves, stop valves and water pipe, \$12,000. C. E. Davis, City Hall, Chief of Water Dept.

Que., Montreal—Plans 25,000,000 gal. reservoir, 500 ft. square and 18 ft. deep, Atwater Ave., \$500,000. H. A. Tetreault, Dir. Pub. Wks.

R. I., Central Falls—It is proposed to impv. and extend water pipe system, \$150,000. S. P. Cummings, City Engr.

Tex., Floresville—\$10,000 water works bonds voted.

Tex., Murray—\$60,000 water ext. bonds voted.

Wash., Monroe—City will call for bids in near future on water works system, incl. 1,000,000-gal. concrete reservoir, 6 mi. 8-18 in. and 32,500 ft. 4-10 in. wood stave pipe, 425 cu. yds. concrete, 14,000 cu. yds. excav., \$84,000. Miller Eng. Co., Burke Bldg., Seattle, Engrs.

Wash., Walla Walla—It is proposed to const. Division 2 of water system, incl. four mi. pipe line to Wenaha Natl. Forest, gravity type dam, 100 ft. wide, 16 ft. high, sluice gates, telephone pole line and wagon road, \$140,000. E. B. Hussey, Alaska Bldg., Seattle, Engr.

W. Va., Wheeling—The J. N. Chester Engineers, Pittsburgh, Pa., are now prep. plans and specifications for new water works system for city, \$2,000,000.

Wis., South Milwaukee—Bids being called for waterwks.

Wis., Sparta—City Coun. contemp. ext. water service.

Wis., Eagle River—Water Sys.—Contemp. Ed. Eckhoff, Supt. Water and Light Dept. W. G. Kirchoffer, Madison, Engr.

Wis., Blue Mounds—Waterwks Sys., Reservoir—Contemp. Peter Brage, Vil. Clk. \$7,000.

FIRE

B. C., Victoria—The Victoria fire department has been authorized to purchase a fire truck or a motor pump at a cost of \$4,000. The wreck of one of the department's trucks last year has impaired the efficiency of the department and new equipment is required at once according to the chief.

Cal., Dinuba—Voted in favor of \$15,000 5½% fire engine bonds. C. T. Reagan, City Clk.

Del., Milford—The Carlisle Fire Co. is taking steps to secure necessary financial backing for the erection of a new fire house and the purchase of another hook and ladder truck.

Fla., Homestead—It has been decided to impv. the fire dept.

Mo., Denton—There is a movement to buy apparatus for a volunteer fire company here. The town has a small volunteer department with little or no equipment.

Mass., Leicester—Each of the three districts in this town wants a piece of motor apparatus.

Mass., Turners Falls—The horse-drawn chemical is to be motorized at cost of \$2,500.

Mass., Ludlow—A special town meeting was conducted and it was voted to appropriate \$885 for better fire protection.

Mont., Miles City—Chief Aitchison announces that the department is in need of equipment, including a deluge set for mounting on the apparatus, 1,000 ft. of hose, two shut off nozzles and one life net.

Mont., Missoula—The City Council has authorized the fire chief, James T. Cranney, to advertise for bids for 1,500 ft. 2½-in. hose, a gas mask and a cellar nozzle.

Mont., Baker—Mayor Heinrich appointed L. M. Corbitt the marshal to install hydrant and hose at the pump house for fire facilities.

N. J., Asbury Park—City is in need of new fire apparatus.

N. Y., Riverhead—Fire commissioners will ask the taxpayers at annual meeting in July for an appropriation of \$10,000 for motor apparatus.

N. Y., Greece—Residents of the Ridge Road fire district voted unanimously to pay \$10,000 for fire truck, with triple combination equipment.

N. Y., Le Roy—Citizens are considering the question of purchasing new fire apparatus.

N. Y., Wayland—It is planned to purchase site for new firemen's building which, it is expected, will be erected during the coming summer.

N. Y., Woodbury—City has voted to buy two motor fire trucks.

N. Y., Mechanicville—At a special election taxpayers voted \$14,000 for fire apparatus. The vote was 221, and against 40.

N. Y., Ellicottville—Village seeks appropriation for fire truck, \$1,900.

O., Newton Falls—Ordinance has been passed authorizing mayor to purchase five hundred feet of fire hose.

O., Mansfield—Ordinance has been passed to provide for purchase of apparatus and supplies for fire dept.

O., Olive Branch—A fire here has entailed a loss of \$50,000. Further destruction was prevented by the arrival of the Cincinnati department. Cincinnati was not summoned only as a last resort as the charge for their services is \$100 per hour. The village is without any adequate equipment.

O., Kenton—The electric fire alarm signal system of this city has been damaged and rendered inoperative as the result of the big storm which visited the city last week.

O., Delaware—The council of the village of Ashley has purchased a prospect motor fire truck, combination pump chemical hose and ladder for the department of that village.

O., Warren—City Solicitor Marion Lea will draw a new ten-year contract with the Ohio Public Service Co. calling for a rate of \$19.50 a year for 100 candle power lights. The present contract is for the same price for 60 candle power. It remains to be seen whether the company will accept.

O., St. Clairsville—Volunteer fire dept. is being organized.

O., Mt. Vernon—Ordinance has been passed to issue bonds for purchase of buying hose and hydrants for fire dept.

O., Ironton—The village of Wheelersburg has just been visited by a \$25,000 fire. The village having no fire protection, aid was furnished by the department of the village of New Boston.

O., Akron—Ord. passed auth. \$6,500 6% 1-9 yr. sr. Fire Department bonds.

O., Mt. Vernon—Auth. \$44,000 5% street bonds and \$1,000 6% 1-5 yr. sr. Fire Department bonds.

O., Oberlin—Ord. passed auth. issue of 5½% semi-annual, coupon Engine and Pump bonds, \$15,000.

Pa., New Bethlehem—Repairs to fire truck have been recommended.

Pa., Erie—Safety Director Elchorn has recommended a bond issue of \$20,000 for a new fire alarm system here.

Pa., Bainbridge—In near future a meeting will be held to decide kind of apparatus to be purchased for fire protection in this section.

Pa., Steelton—Citizens' Fire Engine House is being remodeled.

Pa., Glenside—Two thousand dollars of the \$13,000 needed to purchase new fire truck were collected recently.

Pa., McKees Rocks—Bond issue has been passed to impv. fire protection.

Pa., Corry—It is reported that the fire dept. of this city will be motorized.

Pa., Old York Road—The sum of \$40,000 will be expended by three volunteer fire companies for apparatus.

Pa., Nanty Glo—Fire Co. No. 1 will raise funds for new equipment.

Pa., Appelo—Fire dept. is in need of more up-to-date equipment.

R. I., Woonsocket—National Underwriters' Association suggests the erection of new fire station to replace present No. 3 station.

Tex., Houston—This city, O. F. Holcombe mayor, will close bids this week for the construction of a fire and police station. The structure will be of steel and will cost \$175,000.

W. Va., Mannington—The West Virginian Fire Underwriters' Assn. has recommended that better fire protection be provided for this town.

BRIDGES

Ala., Huntsville—State Hwy. Dept., Montgomery, Ala., plans building of concrete bridges on Big Cove Rd. from Huntsville to Marshall county line.

Ark., Texarkana—Will vote June 24 on bond issue for const. 3 bridges, across Sulphur River, \$65,000.

B. C., Victoria—Pub. Wks. Committee has been authorized to rebuild a 40-ft. bridge on Shelbourne St. City Engr., F. M. Preston.

Conn., New Haven—Expect Govt. approv. for temporary Tomlinson bridge in few days, \$43,000.

Fla., Daytona—Volusia Co. Comrs., DeLand, Fla., plan to reconstr. present concrete bridge at estimated cost of \$135,000.

Fla., Fort Lauderdale—Co. Comrs., H. G. Wheeler, chairman, will erect two concrete bridges to replace present wooden bridges over canal at Himmarsh Park. Comrs. plan to place concrete supports around wood piling of bridge across Las Olas sound.

Fla., Quincy—St. Lucie Co. (Ft. Pierce) voted \$35,000 bonds const. 5,000 ft. timber trestle and sand fill, over Indian River. R. D. Carter, Vero, Engr.

Ga., Savannah—Plans for const. of bridge across Savannah River have been completed and will be sent to district federal road-bridge engr. at Montgomery, Ala., for approval. State Hwy. Dept., Atlanta, will invite bids in a few days. First part of bridge will be across Front River and will be 1,490 ft., incl. draw span; concrete.

Middle part of bridge will be 1,815 ft. long, and of concrete. Other section of bridge will be 1,998 ft. long (across Little Back River), and of either concrete or treated timber. Two smaller bridges will be built across Laurel Hill and Beach Hill Canals; concrete or treated timber. Division Engr., State Hwy. Dept., Savannah, W. R. Neel, State Hwy. Engr., Atlanta.

Mo., Howard Co.—\$105,000 bridge bonds voted.

Neb., Geneva—Fillmore co. plans bridge P 541, between Sects. 9-16 Bryant Twp., one 16 ft. conc. slab, conc. abutments, 20 ft. rdway; bridge H 221, between Sect. 26-35, Belle Prairie Twp., one 20 ft. conc. arch, 16 ft. rdway, conc. abutments, alternate of 20 ft. I beam slab, 16 ft. rdway, on steel pile abutments; bridge N 241, between Sects. 28-33, Bennett Twp., one 20 ft. arch, 16 ft. rdway, conc. abutments, alternate of 20 ft. I beam, 16 ft. rdway, steel pile abutments; bridge M B 31, between Sects. 23-24, Grafton Twp., one 16 ft. conc. slab, 16 ft. rdway, conc. abutments, alternate 17 ft. I beam, 16 ft. rd. steel pile abutments.

N. J., Pompton Lake—Boro Com. requested Passaic Co. Bd. Freeholders to widen Ringwood Ave. bridge.

N. J., Jersey City—Headings will be held to consider elimination of grade crossings.

N. Y., Boro Queens—Plans being made to const. subway under Queens Boulevard.

N. Y., Pulaski—Twn. Richland considering replacing lift bridge across Salmon River, \$18,000. Will call meeting soon for bond issue to constr. new bridge, \$53,000.

North Carolina—Bids rejected const. re-conc. bridges and culverts on State Proj. 888, Yancey co. Will readvertise, \$40,000.

N. C., Lenoir—Plans prep. for new conc. bridge over Johns River.

O., Toledo—Request made to eliminate East Bdw. grade crossing. Will consider \$150,000 proposed bond issue. Subway under tracks about \$450,000.

O., Steubenville—Senate auth. const. bridge across Ohio River.

O., Paintsville—Under a contract just awarded work is to be begun immediately on a steel bridge across the Big Sandy River at the mouth of Paint Creek. A companion bridge will be erected over Buffalo Creek and a new road will tap the highway to Inez, Martin Co.

Ont., Sioux Lookout—On June 14, by-law providing for the raising of \$10,000 for const. of bridge, grading, etc., will be submitted to ratepayers. Clerk, J. E. Cole.

Ont., Birch Cliff—General contr. for four-roomed addition to Birch Cliff Public School, S. S. No. 15, was awarded to Norman McLeod, Ltd., at approximately \$37,500. Burden, Gounilock & Carter, Toronto, Associate Architects.

Ont., Toronto—The proposal for a subway under the G. T. R. track at Ashdale Ave. was again presented to the Works Committee after being laid over for a year.

Pa., Phila.—Details for const. Delaware River bridge being discussed.

Pa., York—Co. Comrs. decided to replace large wooden bridge across Codarus Creek on state hwy. between Spring and Hanover.

Pa., Dunnsville—Steel work is being rushed for the construction of a new bridge over the Normanskill creek on the Western turnpike road to replace the old wood covered bridge which has served for 80 years.

Pa., Saltsburg—Old wooden bridge spanning Kiskiminetas River has been destroyed by fire.

S. C.—New bridges are to be constructed over the Pacolet River on the Chesnee Road and on the National Highway and an inter-county bridge over the Enoree River between Spartanburg and Laurens.

S. C., Union—State Hwy. Dept., Columbia, invites bids until June 26 for erecting bridge over Tiger River on Union-Whitmire Rd., Union county; 13 22-ft. concrete spans and 168-ft. steel span; 107,985 lbs. steel reinforcement; 168,000 lbs. structural steel. Bids are invited until the same date for constructing reinforced concrete bridge over Union-Whitmire Rd.; four 22-ft. spans. W. B. Deneen, Co. Engr., Union.

S. C., Charleston—South Carolina State Hwy. Dept., Columbia and Charleston San. Draining Comn. having plans prep. for bridge over Ashley River, \$500,000.

S. C., Barnwell—Hwy. Dept. has plans to const. bridge over Salkehatchie River. Bids latter part of June.

Tex., San Antonio—Southern Pacific R. R. bridge and international bridge spanning Rio Grande have been washed away by flood.

Tex., Ballinger—Runnels co. plans 300 ft. bridge over Elm Creek, on State Hwy. 7, with one 125 ft. steel truss span on conc. piers and conc. trestle.

Tex., Runnels Co. (P. O. Ballinger)—A petition is being circulated for an election to vote the issuance of the following bonds: Colorado River bridge, \$50,000; Elm Creek bridge, \$35,000; Elm Creek bridge, \$30,000.

Tex., Canadian—Bids being called for new bridge over Washita River, two 80-ft. steel spans, five bents 19½ ft. long as trestle approaches, \$12,500.

Wash., Seattle—Plan const. huge steel bridge across Snake River on route of Inland Empire Hwy. Constructing steel bridge with concrete abutments and approaches over the Snake river at Central Ferry, Federal aid project No. 98, involving the following approximate quantities: 3000 cu. yds. of excavation for substructure, 4270 cu. yds. concrete, 210,000 lbs. reinforcing steel, 1,900,000 lbs. structural steel; grading and draining of 0.75 mile of the Pacific highway, Chehalis southeast, in Lewis county; clearing, grading and draining 1 mile of the Pacific highway south of Castle Rock in Cowitz county. Plans and specifications covering the above work will be on file at the office of the Journal of Commerce within the next few days, according to word received from Olympia today.

Wash., Everett—Petn. being signed for const. new bridge across Snohomish River.

W. Va., Charleston—Plans being prep. to urge const. Watts St. viaduct.

W. Va., Benwood—Joint meeting held to decide const. new bridge at Hichman's mine between two towns.

TOO LATE FOR CLASSIFICATION

STREETS AND ROADS

Cal., Sacramento 2 p.m., July 3
For const. 10.8 mi. st. hwy. in Santa Barbara Co. and 8.8 mi. in Orange Co.—A. B. Fletcher, St. Hwy. Engr.

Ill., Chicago 11 a.m., June 27
For const. pav. on various sts.—Bd. Local Impvs.

Minn., Buffalo 2 p.m., July 10
For excav. and overhaul—E. R. Anderson, Co. Aud.

N. J., Atlantic City July 12
For rd. pav. in Atlantic Co.—Bd. Freeholders, Guarantee Trust Bldg.

N. J., Elizabeth 2:30 p.m., July 5
For impv. cert. sts. by pav., curbs and gutters—Jacob L. Bauer, Co. Engr.

N. Y., Albany 1 p.m., July 11
For impv. 4.15 mi. hwy. in Cattaraugus Co., 8.82 in Chenango, 7.59 and 7.70 in Delaware, 1.60 in Madison, 10.14 in St. Lawrence, 0.62 in Washington, 4.68 in Wyoming and 2.92 in Yates, and for reconst. 1.27 mi. in Chenango Co.—Herbert S. Sisson, St. Hwy. Comr.

Okla., Oklahoma City June 27
For 2 mi. gravel rd., Proj. 55, Muskogee Co.—St. Hwy. Com.

Ore., Salem 10 a.m., June 28
For grad. and rock surf. 4 rds. in Clackamas, Curry, Umatilla and Union Cos., and const. bridges in Douglas, Lincoln and Sherman-Gilliam Cos.—St. Hwy. Com.

Ore., Salem 10 a.m., June 29
For grad. and rock surf. rds. in Douglas, Tillamook, Umatilla and Walla Walla Cos., and const. bridges in Baker, Union and Wasco Cos.—St. Hwy. Com.

Tex., Dallas 9:30 a.m., June 27
For 1,400 lin. ft. combination curb and gutter—E. Beulah Cauley, Sec'y of Boards.

STREETS AND ROADS

Ala., Morgan Co.—(P. O. Decatur).—County Board of Revenue plans issuing \$409,000 Road bonds.

Ark., Eudora—The City Council will place on the market Paving bonds to the amount of \$20,000.

Cal., San Mateo—\$124,000 Street Imp. bond issue awarded.

Fla., St. Johns Co.—(P. O. St. Augustine).—An election will be called to vote a Road bond issue. (Amount not stated).

Fla., Jacksonville—Citizens request half mile hard surf. hwy. be added to 104th St. road.

Ida., Sand Point—\$10,000 Road bond issue voted.

Ida., Montpelier—\$55,000 Road bonds voted.

Ind., Spencer Co.—\$3,000 Road bonds for Grass Twp. roads awarded to State Bank of Christey.

Ind., Greene Co.—\$8,000 Richland Twp. Road bonds awarded to Meyer-Kiser Bank.

Ind., St. Joseph—\$74,000 Road bonds awarded to Fletcher Savings Bank.

Ind., Pike Co.—\$12,788 Road bonds awarded to City Trust Co., Indianapolis.

Kan., Crawford Co.—\$500,000 Road bonds awarded.

Ky., Grant Co.—\$250,000 Road and Bridge bonds awarded to Well, Roth & Co., Provident Savings Bank & Trust Co.

La., Plaquemines Par.—\$235,500 Road Dist. bonds awarded to Prudden & Co., Toledo.

Mich., Marshall—\$12,000 bond issue for paving East and West St. will soon be offered.

Mich., Muskegon Heights—The city council took final action June 5 on \$65,000 General Improvement and \$25,000 Street Work bonds.

Mich., Newaygo—Will vote June 19 on \$15,000 Paving bonds.

Minn., Detroit—\$150,000 Paving bonds awarded to Wells-Dickey Co., Minneapolis.

Minn., Otter Tail Co.—\$82,000 Hgwy. reimbursement bonds awarded to Drake Ballard Co., Minneapolis.

Minn., Mankato—\$60,000 Paving bonds awarded to Drake Ballard Co., Minneapolis.

Vt., Montpelier June 27
For 5.71 mi. gravel rd. in Orange, 2.15 in Concord and 1.97 gravel or bitum. mac. in Lunenburg—St. Hwy. Com.

Wis., West Allis June 26
For pav.—Bd. Pub. Wks.

SEWERAGE

Ind., South Bend June 27
For const. sewer—Bd. Pub. Wks.

Ind., East Chicago 2 p.m., June 26
For const. sewer in Fir st.—Bd. Pub. Wks.

Me., Lisbon 2 p.m., June 26
For const. portion of system of sewers and drains with appurt.—Town Bd.

Minn., Barnum July 7
For sewer, water sys.—City Clk. A. D. Lath.

S. D., Sioux Falls 9 a.m., June 26
For work in Sewer Dist. 18, also for sewer serv. connections—W. C. Leyse, City Clk.

Wash., Edmonds 8 p.m., June 27
For lateral sewer systems—Geo. M. Leyda, City Clk.

Wis., South Milwaukee June 27
For sewers—City Council.

WATER SUPPLY

Cal., Los Angeles 2 p.m., June 27
For shut off valves, steel pipe and rivets—Dept. Pub. Serv.

D. C., Washington noon, July 17
For const. portion of water supply conduit for D. C.—U. S. Engr. Office, Old Land Bldg.

Minn., St. Paul 11:30 a.m., July 3
For furn. 12 filter operating tables for water dept.—H. W. Austin, Purch. Agt.

O., Hamilton June 27
For disc water meters with couplings—W. F. Mason, Serv. Dir.

Okl., Fairland June 30
For const. waterworks, incl. well, pump house, tank, tower and for 10 mi. transmission line—L. C. Overmiller, Pres., Bd. Trustees.

Miss., Panola—\$50,000 Hgwy. Dist. bonds awarded to A. K. Liggett & Co., Memphis.

Neb., North Platte—\$50,000 Paving bonds voted.

N. J., Jersey City—Bids being called for const. Hudson Co. blvd.

N. J., Hoboken—Ord. passed auth. \$300,000 Street bonds and \$10,000 Temporary Impv. bonds.

N. Y., Westfield—Voted \$46,000 Paving bonds.

N. Y., Youngstown—(Official report).—J. L. Hall, village clerk, informs us that no bond issue has been considered and that an election to vote on \$18,000 Paving bonds was reported erroneously.

N. Y., Albion—\$30,000 Street Paving bonds voted.

N. Y., Nassau Co.—\$1,500,000 Road Impv. bonds awarded to B. J. Van Ingen & Co., New York.

N. Y., Clyde—Will offer \$36,000 Hgwy. bonds in near future.

N. Y., Oriskany—\$3,000 Madison Street Impv. bonds voted.

N. Y., Mt. Morris—Will vote during latter part of June \$78,000 Street bonds, \$18,000 Street bonds.

N. Y., Schenectady—Plan to impv. Erie blvd. and development of Washington Ave., \$600,000 to \$800,000. Ord. prep. for grad., pav. and laying sidewalks, widening and impv. Washington Ave.

N. C., Mount Holly—\$20,000 Street bonds awarded the Central Bank & Trust Co.

O., Fremont—Ord. passed auth. \$30,000 Street bonds.

O., Marietta—Ord. passed auth. \$18,000 Street bonds.

O., Middletown—Ord. passed auth.

O., Painesville—Will vote June 27 on Street subway bonds, \$120,000.

O., Hicksville—Ord. passed auth. \$7,500 M. & S. Street bonds.

Okl., Rogers Co.—(P. O. Claremore).—County commissioners are considering a Road bond issue. (Amount not stated).

Okl., Beekman Co.—(P. O. Sayre).—An election will be held in the near future to vote an issue of Road bonds, \$500,000.

Pa., East Pittsburgh—Council has passed an ordinance providing for a \$38,500 bond issue for Street improvements.

S. D., Sioux Falls 9 a.m., June 26
For water serv. connections from mains—Walter C. Leyse, City Aud.

Tex., Dallas 10 a.m., June 26
For generator, meter box lids and rings—M. G. James, City Sec'y.

Wash., Walla Walla June 27
For ext. 20-in. pipe line in Wenaha forest—Engr. E. B. Hussey.

BRIDGES

Minn., Argyle 2 p.m., June 27
For bridge over Middle River—H. S. Beckwith, Town Clk.

O., Columbus 10 a.m., July 8
For const. cert. bridges—Bd. Co. Comrs.

Pa., Sunbury June 26
For reconst. bridge in Northumberland Co.—Co. Comrs.

Tex., Hempstead July 2
For const. iron span 150 ft. long and 16 ft. wide—Comrs., Court of Waller Co.

W. Va., Charleston 10 a.m., July 11
For repair of bridge, const. sects. of State rd., also for clean, tar cold surf., etc.—St. Rd. Com.

MISCELLANEOUS

D. C., Washington 2 p.m., July 11
For removing old piles and portion of pier, dredging, etc.—Comrs. D. C.

La., New Orleans noon, June 29
For furn. creosoted piles—Bd. Comrs., Port of N. O.

N. J., Jersey City 3 p.m., June 27
For repair pier and dredging—Bd. City Comrs.

N. Y., New York July 12
For dredging in Passaic River, N. J.—War Dept., 39 Whitehall St.

Pa., Philadelphia July 16
For dredging in Del. River, Camden, N. J.—War Dept., Dist. Engr.

R. I., Providence July 12
For rock removal in Stanford Harbor, Conn.—War Dept., Asst. Engr.

Pa., Economy Twp.—On May 16 an issue of \$45,000 Road bonds was favorably voted.

Pa., Red Lion—A petition has been received by the Council to issue Paving bonds. (Amount not stated).

Pa., Lansdale—The election held May 16 to vote on \$60,000 Street bonds was carried.

Pa., Indiana—Council is preparing to issue \$50,000 Street Improvement bonds.

Tex., Young Co.—\$300,000 Road bond issue has been proposed.

Tex., Hearne—City considers issuing \$200,000 Road bonds.

Tex., Georgetown—City voted \$85,000 Paving bonds.

Tex., Fort Bend—\$500,000 Road bonds voted.

Va., Franklin Co.—\$50,000 Road bonds being contemplated.

Va., Newport News—\$600,000 School and \$300,000 Paving bonds will be voted during this month.

SEWERAGE AND SANITATION

Fla., Miami Beach—Will vote July 25 on \$125,000 Sewer bonds.

Fla., Coconut Grove—\$60,000 Sewerage, Streets and Light bonds voted.

Fla., Winter Haven—\$255,000 Sewer System, Paving, City Hall and Electric Light bonds awarded to Sidney Spitzer & Co., Toledo.

Mich., Detroit—Bids rejected for \$8,000,000 Public Sewer bonds.

Minn., Grand Rapids—\$20,000 Sewer Construction bonds awarded to Kalman Wood & Co., Minneapolis.

Minn., Eveleth—\$60,000 Sewer Ext. and \$15,000 Water Works bonds voted.

Minn., Springfield—\$22,000 Water Works bonds voted.

Mo., Kansas City—The city contemplates an election to vote on \$4,000,000 Sewerage Disposal bonds.

N. J., Phillipsburg—\$250,000 Sewer bonds awarded.

N. J., Collingswood—\$250,000 Sewerage bonds will be offered.

O., Dover—\$11,500 Storm Sewer bonds awarded to State Industrial Com.

O., Akron—An issue of Sewage Elimination bonds, \$700,000, is awaiting the approval of the city council.

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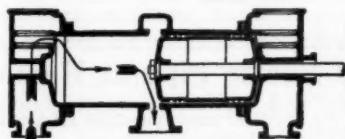
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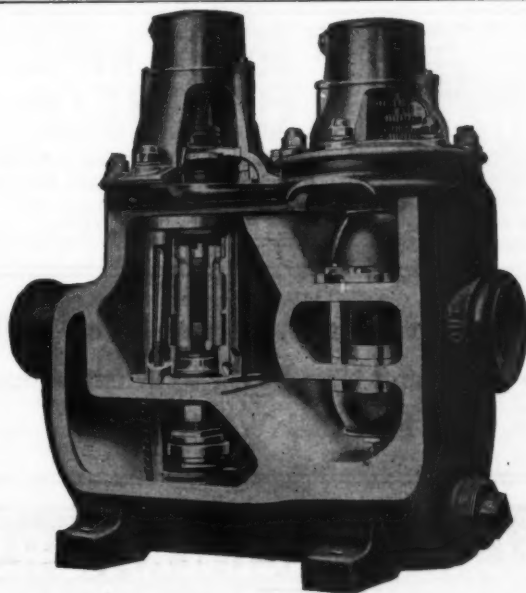
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OFFICIAL ADVERTISING

PENNSYLVANIA STATE HIGHWAY DEPARTMENT, HARRISBURG, PA.—Sealed proposals will be received at the State Capitol until 10 a. m., June 28, 1922, when bids will be publicly opened and scheduled and contract awarded as soon thereafter as possible for the reconstruction of 25,122 ft. of One Course Reinforced Concrete Pavement in Bradford County, Route No. 20; 21,044 feet of One Course Reinforced Concrete and Hillside Vitri-fied Brick Pavement in Cambria County, Route No. 54; 9,638 feet of One Course Reinforced Concrete Pavement in Clarion County, Route No. 214; 7,118 feet of One Course Reinforced Concrete Pavement in Clearfield County, Route No. 234; 8,710 feet of either Bituminous Surface Course on a Concrete Foundation or One Course Reinforced Concrete Pavement in Erie County, Appl. Nos. 1880 and 1875, and 12,997 feet of either Bituminous Surface Course on a Concrete Foundation or One Course Reinforced Concrete Pavement in Erie County, Route No. 258; 39,082 feet of One Course Reinforced Concrete Pavement in Indiana County, Route No. 228, and 27,632 feet of One Course Reinforced Concrete Pavement in Indiana County, Route No. 228; 24,856 feet of One Course Reinforced Concrete Pavement in Lackawanna County, Route No. 365; 27,081 feet of One Course Reinforced Concrete Pavement in Lawrence County, Route No. 79; 22,171 feet of One Course Reinforced Concrete Pavement in Susquehanna County, Route No. 12; One Span Plate Girder Bridge in Cumberland County, Route No. 250; 803 feet of One Course Reinforced Concrete Pavement in Westmoreland County, Application No. 1264. Bidding blanks and specifications may be obtained free, and plans upon payment of \$2.50 per set, upon application to State Highway Department, Harrisburg. No refund for plans returned. They also can be seen at office of State Highway Department, Harrisburg, 1001 Chestnut Street, Philadelphia, 119 Federal Street, N. S., Pittsburgh, Pa. George H. Biles, Assistant State Highway Commissioner. (23-24-25)

PENNSYLVANIA STATE HIGHWAY DEPARTMENT, HARRISBURG, PA.—Sealed proposals will be received at the State Capitol until 10 a. m., June 27, 1922, when bids will be publicly opened and scheduled and contract awarded as soon thereafter as possible for the reconstruction of 6,067 feet of One Course Reinforced Concrete and Hillside Vitri-fied Brick Pavement in Armstrong County, Route No. 251; 11,215 feet of One Course Reinforced Concrete Pavement in Bradford County, Route No. 20; 13,917 feet of One Course Reinforced Concrete and Hillside Vitri-fied Brick Pavement in Butler County, Route No. 251; 9,596 feet of One Course Reinforced Concrete Pavement in Cambria County, Route No. 62, and 23,751 feet of Either Vitri-fied Brick or One Course Reinforced Concrete and Hillside Vitri-fied Brick Pavement in Cambria County, Route No. 221; 2,510 feet of One Course Reinforced Concrete Pavement in Clarion County, Route No. 237, and 12,815 feet of One Course Reinforced Concrete and Hillside Vitri-fied Brick Pavement in Clarion County, Route No. 214; 7,057 feet of One Course Reinforced Concrete Pavement in Crawford County, Application Nos. 1867 and 1868; 28,323 feet of One Course Reinforced Concrete Pavement in Indiana County, Route No. 263; 18,709 feet of One Course Reinforced Concrete Pavement in Jefferson County, Route No. 338; 8,648 feet of One Course Reinforced Concrete Pavement in Lackawanna County, Route No. 322; 12,048 feet of One Course Reinforced Concrete Pavement in Luzerne County, Route No. 4; 24,042 feet of One Course Reinforced Concrete Pavement in McKean County, Route Nos. 100 and 101; 15,659 feet of One Course Reinforced Concrete Pavement in Northumberland and Montour Counties, Route No. 2; 20,057 feet of One Course Reinforced Concrete Pavement in Susquehanna County, Route No. 174; and One Reinforced Concrete Bridge in Cumberland and York Counties, Route No. 123. Bidding blanks and specifications may be obtained free, and plans upon payment of \$2.50 per set, upon ap-

plication to State Highway Department, Harrisburg. No refund for plans returned. They also can be seen at office of State Highway Department, Harrisburg, 1001 Chestnut Street, Philadelphia, 119 Federal Street, N. S., Pittsburgh, Pa. George H. Biles, Assistant State Highway Commissioner. (23-24-25)

PROPOSALS FOR PUBLIC COMFORT STATION

June 21st, 1922.

Sealed proposals will be received by the Superintendent of Streets and Public Improvements, Harrisburg, Pa., at his office, Room No. 408, Dauphin Building, Harrisburg, Pa., up until noon of Wednesday, July 12th, 1922 (Standard Time), for the construction of a Public Comfort Station, N. E. Corner, Second and Market Streets, Harrisburg, Pa.

- (1) General Contract.
- (2) Plumbing.
- (3) Heating and Ventilating.
- (4) Electric Lighting and Power

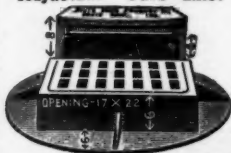
Plans and specifications may be seen at the office of the Superintendent of Streets and Public Improvements or at the office of C. Howard Lloyd, Architect, Suite A, Telegraph Building, Harrisburg, Pa. Bidders may obtain drawings and specifications by depositing with either of the above the sum of \$25.00 which will be refunded upon the return to the office from which they were received, not later than noon of July 12th, 1922, of all plans and specifications in good order.

Proposals will be received and considered only upon the terms and conditions set forth in the specifications and are to be properly marked and addressed to the undersigned. The right to reject any or all bids is reserved.

W. H. LYNCH, Superintendent.

(25)

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WATER WORKS IMPROVEMENTS Reading, Pennsylvania

SEALED PROPOSALS will be received by the Council of the City of Reading, Pennsylvania, until 8:30 A. M., Eastern Standard time, Wednesday, July 5, 1922, for the following contracts:

Contract No. 24—Foundations and Suction Vault for Pump No. 4.

Contract No. 25—Cast-Iron Pipe and Specials.

Contract No. 26—Test Borings.

Plans, specifications and bidding blanks can be had after June 21, 1922, at the office of the Chief Engineer, Bureau of Water, Reading, Pa., upon deposit of ten dollars, which deposit will be returned to the successful bidders and to others upon return of plans and specifications in good condition not later than 30 days after the opening of the bids.

Bidders must accompany their bids by cash, proposal bond or certified check for an amount equal to 10 per cent. of the total amount of the bid.

A satisfactory bond will be required for the faithful performance of the contract, for an amount equal to one-half of the total amount bid.

In all the work herein embraced, preference shall, at all times, be given to local laborers and mechanics and the contractor must comply with the Workmen's Compensation Insurance Act.

Proposals must be made separately for each contract, enclosed in separate envelopes with contract number marked thereon, and addressed or delivered to City Council, in care of City Clerk, City Hall, Reading, Pa.

Council reserves the right to reject any or all bids and to accept any bid which, in its judgment, is for the best interests of the city.

D. E. DAMPMAN,
Supt., Dept. of Parks and Public Property.

EMIL L. NUEBLING,
Chief Engineer, Bureau of Water.
(25)

HIGHWAY WORK OFFICE OF THE STATE COMMISSION OF HIGHWAYS

Sealed proposals will be received by the undersigned at their office, No. 55 Lancaster Street, Albany, N. Y., at one o'clock P. M., advanced standard time, which is twelve o'clock noon eastern standard time, on Friday, the 30th day of JUNE, 1922, for the improvement of highways in the following Counties:

ALLEGANY(one highway):2.77
CHAUTAUQUA(one highway):4.59
FRANKLIN(one highway):2.23
LIVINGSTON(one highway):6.65
ONONDAGA(one highway):7.16
ST. LAWRENCE(one highway):9.38
SCHUYLER(one highway):4.99
SUFFOLK(one highway):8.33
WESTCHESTER(one highway):0.93

Maps, plans, specifications and estimates may be seen and proposal forms obtained at the office of the Commission in Albany, N. Y., and also at the office of the division engineers in whose division the roads are to be improved. The addresses of the division engineers and the counties in which they are in charge will be furnished upon request.

The special attention of bidders is called to "General Information for Bidders" in the itemized proposal, specifications and contract agreement.

HERBERT S. SISSON,
Commissioner.

J. C. FINCH,
Secretary.

(24-25)

TENDERS FOR RUBBISH RECEPTACLES

Sealed tenders addressed to the Chairman of the Board of Control will be received by registered post only up to 12 o'clock noon on Tuesday, July 18th, 1922, for the supply of five hundred (500) Closed Waste Paper and Rubbish Receptacles carrying advertising matter, to be placed at determined and designated locations on the streets of Toronto. Tenders must be plainly marked on the outside of envelope "Tenders for Waste Paper and Rubbish Receptacles." Form of tender and conditions of tendering and specifications may be had on application at the office of the

Street Commissioner, Room No. 1, City Hall. The usual conditions pertaining to tendering, as prescribed by city by-law, must be strictly complied with. The highest or any tender not necessarily accepted.

C. A. MAGUIRE (Mayor), Chairman.
(25)

HIGHWAY WORK OFFICE OF STATE COMMISSION OF HIGHWAYS

Sealed proposals will be received by the undersigned at their office, No. 55 Lancaster Street, Albany, N. Y., on Tuesday, the 11th day of July, 1922, at one o'clock p. m., advanced standard time, which is twelve o'clock noon, eastern standard time, for the improvement of highways in the following counties:

CATTARAUGUS(one highway):4.15
CHENANGO(one highway):8.82
DELAWARE(two highways):7.59 & 7.70
MADISON(one highway):1.60
ST. LAWRENCE(one highway):10.14
WASHINGTON(one highway):0.62
WYOMING(one highway):4.68
YATES(one highway):2.92

ALSO FOR THE RECONSTRUCTION OF THE FOLLOWING:

CHENANGO(one contract):1.27

Maps, plans, specifications and estimates may be seen and proposal forms obtained at the office of the Commission in Albany, N. Y., and also at the office of the division engineers in whose division the roads are to be improved or reconstructed. The addresses of the division engineers and the counties in which they are in charge will be furnished upon request.

The special attention of bidders is called to "General Information for Bidders" in the itemized proposal, specifications and contract agreement.

HERBERT S. SISSON, Commissioner.
J. C. FINCH, Secretary.
(25-1-2)

O., Portsmouth—Dr. O. D. Tatje, health commissioner, will appeal to the council to establish a garbage disposal plant. He will do this on the instruction of the city health board.

Pa., Heidelberg—On May 16 voted in favor of \$55,000 Sewer bonds.

S. C., Greenville—\$300,000 Sewer bonds and \$100,000 Water bonds voted.

Tex., Jacksboro—Bids until June 29 for \$70,000 bonds for const. sewer sys.

W. Va., Morgantown—Ord. passed auth. \$750,000 Sewer bonds.

W. Va., Morgantown—An election will probably be held July 13 to vote on \$750,000 Sewer bonds.

Wis., Two Rivers—\$100,000 Sewer bonds voted.

LIGHTING AND POWER

Fla., St. Petersburg—\$350,000 Electric Light bonds voted.

Ga., Meigs—\$15,000 Electric Light bonds recently voted will be offered soon.

Id., Missouri Valley—About to vote \$90,000 Municipal Electric Light and Power Plant bonds.

Mich., North Muskegon—Will submit \$30,000 Electric Extension bond issue soon.

Minn., Wilmont—Voted \$14,000 Electric Light Plant bonds.

Neb., Herman—About to vote \$11,500 Electric Light bonds.

N. D., Hillsboro—\$12,000 voted for electric distribution system.

N. C., Hobgood—Will issue \$10,000 Electric bonds. E. L. Bradley is clerk.

Okla., Okenah—A resolution has been introduced calling for the issuance of \$75,000 to \$100,000 Electric Lighting Extension bonds.

Okla., Locust Grove—Voted \$20,000 Light bonds.

WATER SUPPLY

Cal., Hermosa Beach—An election has been called to vote \$500,000 bonds for the following purposes: Municipal water works system, municipal sewer system, municipal auditorium, pier extension, fire fighting apparatus, piping in city.

Fla., West Palm Beach—\$100,000 High Pressure Water, \$10,000 Water-front Impv. bonds voted.

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(25-26)

Id., Columbus—About to vote \$10,000 Municipal Water Works bonds.

La., Winnsboro—\$800,000 Water and Sewerage bonds voted.

Md., Williamsport—On June 6 voted \$100,000 Water System bonds.

Mass., Brockton—\$60,000 Water bonds awarded to Old Colony Trust Co., Boston.

Mich., Lansing—Will soon offer for sale \$10,000 Water and Sewer bonds.

Mich., Buchanan—An election will be held in the near future to vote an issue of Water bonds. (Amount not stated).

Mo., Eldon—\$81,000 Water Works and sewer bonds voted.

Neb., Columbus—Election July 11 for const. water works system and main storm sewer extension, \$35,000.

Neb., Thurston—\$13,800 Water bonds awarded to White Phillips Co., Denver.

N. J., Burlington—Ord. passed auth. \$20,000 Water bonds and \$10,000 Paving bonds.

O., Oberlin—Ord. passed auth. \$15,000 Engine and Pump bonds.

Okla., Hugo—Will issue \$150,000 5½ per cent Water bonds.

Ore., Drain—\$18,000 Water bonds awarded to Rice & Rice.

Pa., Braddock—Will vote July 17 on \$14,000 Water System bonds.

S. C., Greenville—\$300,000 Sewer and \$100,000 Water bonds voted.

Tex., Jacksboro—Bids June 29 for extension water system, \$5,000.

Tex., Floresville—The Attorney General has approved \$10,000 5 per cent 10-20 year op. Waterworks bonds.

Va., Bristol—An election will be held on August 3 to vote an issue of Water Works bonds to the amount of \$50,000.

W. Va., Williamsport—Voted \$10,000 Water bonds.

BRIDGES

Ill., Chicago—The voters of the city have approved the issuance of the following bonds: Bridge, \$3,400,000; Lighting, \$2,000,000.

Mo., Saline Co.—(P. O. Marshall).—The election held on June 2 resulted by a vote of 5,778 to 1,700 in favor of issuing Bridge bonds to the amount of \$300,000.

N. Y., Lily Dale—On May 9 voted in favor of issuing \$12,000 Bridge bonds.

N. Y., Schenectady—The Schenectady Trust Co. was the successful bidder for the 6 months Bridge notes to the amount of \$385,000 at 3.75 per cent plus a premium of \$3.75. Wm. A. Wick, City Comptroller.

O., Sidney—An ordinance was passed by the City Council on May 22, authorizing an issue of 6 per cent Bridge Construction bonds, \$5,500.

Tex., Fort Bend Co.—(P. O. Richmond).—An election will be held on July 1 to vote an issue of State Highway and Bridge bonds, \$100,000.

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of Names of Firms from Whom to Buy Material, Appliances and Machinery Needed by Public Works Departments and Contractors

CONTRACTORS' EQUIPMENT

(See Paving Machinery also)

Asphalt Block Press
Nat'l Moulding Press Corp.

Air Compressors
Ingersoll-Rand Co.
Schramm, Chris. D., & Son
Sullivan Mch. Co.

Air Compressors, Portable
Ingersoll-Rand Co.

Ash Handling Mach.
Blaw-Knox Co.

Angle Splice Bars
Sweet's Steel Co.

Asphalt Block Press
Nat'l Moulding Press Corp.

Backfillers
Pawling & Harnischfeger Co.

Bar Benders
Ransome Concrete Mach. Co.

Bar Cutters
Ransome Concrete Mach. Co.

Bins
Ransome Concrete Mach. Co.

Blasting Powder
Atlas Powder
Du Pont de Nemours Co.

Bolts, Tee Head
Sweet's Steel Co.

Braces, Trench
The Duff Mfg. Co.

Bridges
American Bridge Co.
Blaw-Knox Co.
Russell Grader Mfg. Co.
Truscon Steel Co.

Bridge & Wharf Timbers
(Creosoted)
Wyckoff Pipe & Creo. Co., Inc.

Buckets, Automatic & Dumping
Blaw-Knox Co.
Ransome Concrete Mach. Co.

Buckets, Clam Shell
Dragline, Orange Peel
Blaw-Knox Co.
L. P. Green
Russell Grader Mfg. Co.

Cableways
Flory Mfg. Co.

Cars, Dumping and Industrial
Good Rds. Mch. Co., Inc.
Koppel Industrial Car & Equipment Co.

Carts, Concrete
Acme Road Mch. Co.
Columbia Wagon & Body Co.
Ransome Concrete Mach. Co.

Castings
Burch Plow Works Co.
Republic Iron Works
South Bend Foundry Co.
U. S. Cast Iron Pipe & Foundry Co.

Caterpillar Tractors
Holt Mfg. Co., Inc.

Chutes, Concrete
Ransome Concrete Mach. Co.
U. S. Cast Iron Pipe & Foundry Co.

Clips, Rail, Forged
Sweet's Steel Co.

Concrete Block Machines
Republic Iron Works

Conduits (Creosoted)
Wyckoff Pipe & Creo. Co., Inc.

Cranes, Locomotive
Ball Engine Co.
Erie Steam Shovel Co.
Koehring Co.
Orton & Steinbrenner
Pawling & Harnischfeger Co.

Cranes and Hoists
S. Flory Mfg. Co.
Pawling & Harnischfeger Co.

Cross-Arms (Creosoted)
Wyckoff Pipe & Creo. Co., Inc.

Cross-Ties (Creosoted)
Wyckoff Pipe & Creo. Co., Inc.

Crushers
Acme Road Mch. Co.
Good Rds. Mch. Co., Inc.

Dinkeys
Koppel Industrial Car & Equipment Co.

Ditchers and Graders
Russell Grader Mfg. Co.

Drills
Ingersoll-Rand Co.
Schramm, Chris. D., & Son
Sullivan Mch. Co.

Dump Bodies, Steel
Columbia Wagon & Body Co.
Heil Co., The
Mandt Body Co.

Dump Wagons
Acme Road Mch. Co.
Austin-West. Rd. Mach. Co.
Good Rds. Mch. Co., Inc.
Heil Co., The
Standard Steel Wks.
Tiffin Wagon Co.

Engines
Avery Co.
Flory Mfg. Co.
Schramm, Chris. D., & Son

Excavators
Ball Engine Co.
Blaw-Knox Co.
Erie Steam Shovel Co.
L. P. Green
Koehring Co.
Osgood Co.
Pawling & Harnischfeger Co.

Explosives
Atlas Powder Co.
E. I. du Pont de Nemours & Co.

Hammer Drills
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Connery & Co., Inc.
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Honhorst, Jos., Co.

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Truscon Steel Co.

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Good Rds. Mch. Co., Inc.

The Kinney Mfg. Co.

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Picks
Wyoming Shovel Works

Pumps—Oil and Asphalt
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Good Rds. Mch. Co., Inc.

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Sullivan Mch. Co.

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Standard Steel Works

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Holt Mfg. Co., Inc.

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Wagon Loaders
Conant Machine Co.

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Standard Oil Co. (N. Y.)
Texas Co.

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Barrett Co., The
Standard Oil Co. (Ind.)
Standard Oil Co. (N. Y.)
Texas Co.

Bituminous Pavements
Barrett Co., The
Texas Co.
Warren Bros. Co.

Contraction Joints
Truscon Steel Co.

Creosoted Wood Block
Republic Creo. Co.
Wyckoff Pipe & Creo. Co., Inc.

Culverts, Corrugated Metal
Newport Culvert Co.

Curb Bars
Truscon Steel Co.

Expansion Joints
Barrett Co., The
Philip Carey Co.
Servicised Products Co.
Truscon Steel Co.

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Oil (Roads)
Barrett Co., The
Headley Good Roads Co.
Standard Oil Co. (Ind.)
Standard Oil Co. (N. Y.)
Texas Co.

Paving Fillers
Standard Oil Co. (Ind.)

Reinforcing Mesh
Truscon Steel Co.

SEWERAGE

Culverts
Burch Plow Works Co.
The Robinson Clay Prod.
Russell Grader Mfg. Co.

Culverts, Corrugated Metal
Newport Culvert Co.

Drain Tile
Robinson Clay Prod. Co.

Joint Compound
(Bituminous)
Ruberoid Co.

Pipe (Cast Iron)
Nat'l Cast Iron Pipe Co.
U. S. Cast Iron Pipe & Fdry. Co.
R. D. Wood & Co.

Pipe Cleaning Machines
W. H. Stewart

Pipe (Reinfr. Concrete)
Independent Con. Pipe Co.

Segment Block Sewer
Robinson Clay Prod. Co.

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Sanitation Corporation

Sewage Disinfection
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Robinson Clay Prod. Co.

Vitrified Sewer Pipe
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See Alphabetical Index on last white page

INDEX TO ADVERTISEMENTS

A	Page		Page K		Page		Page
Acme Road Machinery Co.....	4	Dixon, Jos., Crucible Co.....	20	Kinney Mfg. Co.	7	Ruberoid Co.	3
Alvord, Burdick & Howson....	22	Dow & Smith.....	22	Koehring Company	-	Russell Grader Mfg. Co.....	-
American Appraisal Co.....	22	Duff Mfg. Co., The.....	-	Koppel Industrial Car & Equip-	1	S	
American Cement Machine Co., Inc.	-	Du Pont de Nemours Co., E. I. -	-	ment Co.		Sanitation Corporation	6
American La-France Fire En- gine Co.	E		L			Schramm, Inc.	-
American Tel. & Tel. Co.....	-	East Jersey Pipe Co.....	-	Loper Fire Alarm Co.....	-	Servicised Products Co.	-
Asphalt Association	-	East Ohio Sewer Pipe Co.....	23			Skinner, Frank W.....	22
Atlas Powder Co.	-	Electro Bleaching Gas Co.....	8	M		Smith, A. P., Mfg. Co., The....	8
Avery Co.	-	Emerson Pump & Valve Co.....	-	MacLachlan Reduction Process Co., Inc.	22	South Bend Foundry Co.....	20
		Erie Steam Shovel Co.....	4	Marine Metal & Supply Co... 21		Stacy-Bates Co.	20
B	F			Mueller Mfg. Co.	-	Standard Oil of Indiana.....	1
Badger Meter Mfg. Co.....	19	Farasey, J. D., Mfg. Co.....	-	N		Standard Oil Co. (N. Y.).....	5
Ball Engine Co.....	4	Flory Mfg. Co., S.....	-			Sterling Eng. Co.....	-
Barrett Co., The.....	-	Fraizier Ellms-Sheal Co.....	22	Nat'l Cast Iron Pipe Co.....	8	Stewart, W. H.....	-
Bissell Company, F.....	-	G		Nat'l Moulding Press Corp... -		Stumpf Una-Flow Engine Co... 19	
Black & Veatch	22	Gamon Meter Co.....	-	Nat'l Water Main Cleaning Co.	8	Sullivan Mach. Co.....	-
Blaw-Knox Co.	-	Good Road Machinery Co.....	-	Newport Culvert Co.....	25	Sweet's Steel Co.....	7
Broadway Central Hotel.....	4	Goodyear Tire & Rubber Co.. -		New York Continental Jewel Filtration Co.	8	T	
Brossman, Chas.....	22	Granite Paving Block Mfrs. Assn.	-	Norwood Engineering Co.....	8	Texas Co.	26
Buffalo Springfield Roller Co..	2	Green, L. P., Co.....	-	O		The Martinique	-
Burch Plow Works.....	22	Hansen, A. E.....	22	Ohio Municipal Equipment Co.. 20		Thomson Meter Co.	8
Burns & McDonnell.....	22	Hazen, Whipple & Fuller.....	22	Ohio Vitrified Pipe Co.....	19	Tiffin Wagon Co.....	-
C	H	Headley Good Roads Co.....	4	Orton & Steinbrenner Co....	4	Truscon Steel Co.	-
Caird, James M.....	22	Heil Company	7	P		U.	
Carey, Philip, Co.....	-	Heltzel Steel Form & Iron Co.. 25		Pawling & Harnischfeger Co... 7		Union Water Meter Co.....	19
Clark, H. W., Co.....	-	Hertherington & Berner.....4,		Penn. Salt Mfg. Co.....	-	U. S. Cast Iron Pipe & Fdy. Co.	19
Coldwell-Wilcox Co.	8	Hersey Mfg. Co.....	19	Pittsburgh Meter Co.....	6	Universal Road Mach. Co.....	-
Collins, J. L.	22	Hill & Ferguson.....	22	Pollock, Clarence D.....	22	V	
Columbia Wagon & Body Co., Inc.	5	Holt Mfg. Co., Inc.....	-	Potter, Alexander	22	Vulcan Incinerator Co.....	20
Conant Machine Co.....	-	Honhorst Co., The Jos.....	-	R		W	
Connery & Co., Inc.....	4	I		Ransome Concrete Mach. Co.... -		Warren Bros. Co.....	-
Cook, A. D.	-	Independent Concrete Pipe Co.. 20		Republic Iron Works.....	-	Weber, F., Co.....	-
Cressy Road Sprayer Mfg. Co..	2	Ingersoll-Rand Co.....	-	Robinson Clay Product Co.... 19		Western Structural Co.....	-
Cummer & Son, F. D.....	20	Ingram-Richardson Mfg Co....	6	J		Wiard Plow Co.....	-
D	J			Jaeger Machine Co.....	5	Wood, R. D., & Co.....	6
Davis, B. H.....	22					Wyckoff Pipe & Creo. Co., Inc.	4
Dee, Wm. E., Co.....	23					Wyckoff & Son Co., A.....	
Detroit Trailer Co.	5						

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